4.0 Environmental Consequences

4.1 Introduction

This chapter presents the analysis of impacts for each resource that would be affected by the proposed project. Each section provides an overview of the issues identified during public scoping, discussions with BLM staff, and interviews with industry and local community representatives. The issues and impacts selected for inclusion in each section also are based on the experience and judgment of each resource specialist.

Each section summarizes the method of analysis including the type of information used and the assumptions made during the impact analysis, then describes the analysis of projected impacts for each alternative in as much detail as possible. Resources were evaluated according to the available data, so some discussions are based on qualitative information and some on more detailed quantitative data that was prepared for the project or acquired from a variety of sources.

Impact analysis assumes that the applicant-committed environmental protection measures and those required by the BLM would be successfully implemented. It also is assumes that ICP would comply with state and federal regulations that are applicable to the project. Each section identifies the basis or threshold by which impacts would be considered significant, recommends mitigation measures where appropriate to minimize potentially significant or important impacts, then provides a brief comparison of impacts under each alternative. Residual impacts are those that would remain after environmental protection measures, recommended mitigation measures, and compliance with laws and regulations are completed if impacts cannot be fully avoided or mitigated.

At the end of each resource section is a discussion of cumulative impacts. In its Regulations for Implementing NEPA (40 CFR Parts 1500-1508), the CEQ defines a cumulative impact as follows in Section 1508.7:

> *"Cumulative impact" is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.*

Cumulative impacts are the combination of the individual effects of multiple actions over time in the context of other development in the project area or the region. The individual effects may be minor when considered separately, but may be major or significant when considered in combination with all others in the region. A CEQ memorandum issued in 2005 (CEQ 2005) provides additional guidance on the consideration of past actions in cumulative effects analysis. This memorandum stresses the "forward-looking" nature of NEPA analysis. It states that the effects of past actions are only required to be analyzed if they are relevant and useful to determine whether the proposed project "may have a continuing, additive and significant relationship" to projected future impacts in the region.

The relevant past and current actions within the project area contributed to the current conditions described as the affected environment in Chapter 3.0. For this reason, the cumulative impact analysis included in this chapter focuses primarily on reasonably foreseeable future actions that are known by the BLM at the time this analysis was performed. The impacts of the proposed project and the reasonably foreseeable future actions, along with the effects of the past and current activities that affect the same resources, would combine to have a cumulative impact on the environment in the region.

4.2 Geology and Minerals

4.2.1 Issues

4.2.1.1 Geological Hazards

The primary geological hazards that may be associated with the proposed project in the project area are subsidence leading to ground instability and the effect of unstable oil and gas wells.

Subsidence-related Hazards

Subsidence issues are prevalent in southeastern New Mexico. Subsidence can result from natural conditions found in the Delaware Basin or mineral extraction activities and potentially can affect surface resources, structures, and utilities associated with the project. Removal of subsurface material creates underground voids and collapse of voids may cause subsidence and associated effects.

Oil and Gas Well Integrity

Another major concern is the presence of plugged and currently operating oil and gas wellbores that penetrate the polyhalite ore zone that is proposed to be mined. Oil and gas wells would be subject to forces in the strata in the overburden above mine openings and those forces could cause bending and rupture of well casings allowing escape of unsaturated water and hydrocarbons into surrounding strata. Another concern involves wells that, in addition to being subjected to forces in the overburden above a mined-out area, have, for various reasons (e.g., inadequate cement or severe casing corrosion), a higher risk of integrity failure, which also would allow the escape of unsaturated fluids and hydrocarbons. Unsaturated fluid released due to breached well bore casings could migrate to polyhalite mining areas or cause dissolution of other evaporate zones and create unstable voids. The escape of hydrocarbons in the form of natural gas has the potential to affect the safety of the mine operations and liquid hydrocarbons can contaminate aquifers.

4.2.1.2 Reduced Mineral Resource Recovery

There are several issues related to mineral resources that were raised primarily by the oil and gas industry related to the historical conflicts between mining and oil and natural gas production. Addressed in this chapter are concerns that may result from the proposed project:

- Restricted access to oil and gas resources.
- Damage to existing oil and gas wells and surface facilities resulting in lost or delayed recovery of the resource.
- Increased fluid mineral recovery costs due to drilling and well construction problems.

4.2.1.3 Impacts to Paleontological Resources

Impacts to paleontological resources potentially could occur from the loss and destruction of scientifically important fossils from activities associated with the proposed project.

4.2.2 Method of Analysis

4.2.2.1 Geological Hazards

Subsidence

In the analysis of impacts from subsidence, the following information was reviewed to determine the effect that natural and human-caused subsidence would have on the proposed facilities and land in the project area. The analysis and findings detailed in the technical support document “Environmental Geology Assessment Report for Issues Related to the Proposed Ochoa Mine, Lea County, New Mexico” (AECOM 2012) provide more detail on the background in the project area and many of the issues addressed in this section. Other references used include the following:

- Publicly available reports on local evaporite karst conditions including, but not limited to Bachman (1983); Hill (1996); Lambert (1983); Powers 2003); and Vine (1963).
- Publicly available information on the effects of subsidence on surface infrastructure (Galloway et al. 2008; Johnson 2005).
- Reported and predicted subsidence from historical potash mining (Golder and Associates 1979).
- Predictions of expected subsidence from polyhalite mining (ICP 2011).
- Basic principles of subsidence resulting from the mining of salt and potash (Van Sambeek 2000).

Oil and Gas Activities

The analysis of potential impacts on the proposed project from oil and gas activities was determined based on information available regarding well drilling and completion practices in the project area. The information referenced includes:

- The NM OCD database (OCD 2012) provided well drilling histories, completion reports, sundry notices, plugging reports, relevant correspondence, and environmental files.
- Articles that document the historic drilling and completion practices in the project area (Cearly 2000; K.S. Johnson et al. 2003; Powers 2003; Wills 1942).
- Report on the development of a risk assessment method concerning migration of natural gas from oil and gas wells (Sobolik et al. 2011).

The data and information sources were reviewed for information on well completions, cementing, operational integrity, produced water disposal, and plugging integrity. This information was analyzed to assess the potential risk that the well bores may act as migration pathways for fluids. Well files and geophysical logs online at the New Mexico OCD were reviewed to determine if there are any wells within or closely adjacent to the 50-year mine area (OCD 2012). The wells were reviewed for construction or integrity problems that could pose potential threats to underground safety and efficient mining of the polyhalite. Particular focus was on those wells drilled prior to the 1980s that produced oil and gas or had been productive at one time, but then were idle for an extended period.

Exploratory or development wells that had been drilled and subsequently abandoned within a few weeks or months were not evaluated. Fairly immediate abandonment in accordance with drilling rules with plugs placed at intervals as directed by the supervising agencies would likely avoid the development of unstable subsurface conditions. Wells drilled since the 1980s appeared to have casing strings and cement placement that would preclude the movement of fluids and minimize potential instability. Salt water disposal (SWD) or injection wells were subject to scrutiny because the movement of large amounts of fluids through them could lead to increased salt dissolution through casing leaks adjacent to uncemented zones.

4.2.2.2 Mineral Resources

The information and data listed below were reviewed to determine what impact the proposed project activities would have on the recovery of additional potash resources and impacts to the accessibility to oil and gas resources.

- Information available online in the OCD database (OCD 2013).
- Publicly available publications concerning history of oil and gas development and resource assessment in the Delaware Basin in general and the SPA in particular including Broadhead et al. (2004); Montgomery (1965); Schenk et al. (2008); and Walsh (2006).

- Publicly available information on potash mining in the Delaware Basin including mining history, mining methods, production, and remaining reserves including Barker et al. (2008); Cheeseman (1978); USGS (2012b).
- Government agency documents including the Secretary's Potash Order (51 FR 39425, October 28, 1986) and Order R-111-P (OCC 1988).
- Ochoa Project Mine Plan of Operation, Lea County, New Mexico (ICP 2011).
- BLM projections of future oil and gas drilling in the project vicinity (Engler et al. 2012; Engler and Cather 2013).

4.2.2.3 Paleontological Resources

The PFYC of each formation was used to develop an assessment of risk to potential fossil resources with regard to ground-disturbing activities from the proposed project. The following sources of information were reviewed for the analysis of potential impacts to paleontological resources:

- BLM statutes and guidance regarding regulation of fossil resources on public lands (BLM 2012a).
- Published information sources on paleontological resources in the project area and the Delaware Basin including, but not limited to Harris (1993); Hill (1987); Vine (1963); and Walter (1953).

4.2.3 Assumptions

Assumptions used in the analysis of subsidence impacts:

- The natural process of evaporite dissolution is ongoing and will continue for the foreseeable future.
- Natural subsidence may pose risks equal to human-induced subsidence.
- The potash mining industry in the region has experience with the extraction of tabular ore bodies that result in predictable subsidence effects based on well-established parameters.
- There are no major faults or discontinuities in the project area that would cause the typical subsidence patterns to be altered.
- Significant adverse impacts from subsidence would occur if the hazard presents an imminent risk to public safety.
- Direct effects from subsidence may include damages to roads, utilities, and structures. Impacts from direct effects range from very slight (extension cracks) to severe (sinkholes or other surface collapse features).
- Indirect effects include the alteration of surface drainage, disruption of shallow water tables, and public safety hazards.

Assumptions used in the analysis of potential impacts from oil and gas activities:

- Information available in the OCD online database is substantially complete.
- Oil and gas wells drilled and operated prior to 1980 are the main focus of this analysis for potential impacts on mine operations from oil and gas facilities.
- Operation of wells of uncertain integrity and improperly plugged wells could result in catastrophic subsidence similar to the Wink and Jal sinkholes (described in Section 3.2).

Assumptions used in the analysis of potential impacts to topographic depressions such as karst includes the following:

- Underground voids (karst features) derived from natural processes may be present, but have yet to be manifested on the surface, posing hazards to activities and facilities on the surface through collapse.
- Some topographic depressions may be the result of undocumented karst features despite the low potential for caves and karst in the project area.

Assumptions used for other geological hazards:

- Based on the lack of seismic activity and the absence of active faults in the project area, the risk of impacts due to ground motion and permanent ground deformation are expected to be very low under all alternatives and will not be discussed further in this analysis.

Assumptions used in the analysis of potential impacts to mineral resources include the following:

- Existing mineral resource recovery projections are reasonable.
- Impacts to mineral resources would be considered significant if there were a permanent or irretrievable loss of the ability to access and recover a commercial mineral resource.

Assumptions used in the analysis of impacts to paleontological resources include the following:

- The fossil potential designations for the various formations were based on criteria presented in the BLM PFYC and other available data.
- Impacts would be considered significant if proposed activities resulted in the loss of scientifically important fossils.
- Direct impacts would include the destruction or degradation of fossils.
- Indirect impacts involve the restriction of permitted paleontologists access to potential localities unless a discovery is made due to ground-disturbing activities.

4.2.4 No Action Alternative

If the proposed project is not approved, a number of potential impacts would still present risks to resources in the project area although they would not be caused by polyhalite mining or surface disturbance associated with the proposed project. Those potential risks and impacts are discussed below.

4.2.4.1 Geologic Hazards

Natural subsidence would continue to pose risks to surface resources. The natural processes that resulted in evaporite karst features in the area would continue to pose risks to roads, structures, and surface topography; however, the effects are expected to be minor. Subsidence may damage oil and gas well casings, especially in the old abandoned wells with poor well casing integrity or inadequate plugging before abandonment.

4.2.4.2 Mineral Resources

Under the No Action Alternative, the potash resource in the proposed 50-year mine area would not be recovered, resulting in the loss of revenues, taxes, and royalties from mineral development for the foreseeable future. Should the lease be exchanged for another location, a separate NEPA analysis would be required to address impacts to mineral resources at the new location.

Oil and gas development would continue and may ultimately delay mining the polyhalite ore until fluid mineral resources are depleted.

4.2.4.3 Paleontological Resources

Under the No Action Alternative, there would be no impacts to paleontological resources from mining operations. Due to the low PYFC of the geologic formations and few documented paleontological resources, the potential for adverse impacts to paleontological resources is low for any activities that would remove fossil-bearing rocks in the subsurface.

4.2.5 Alternative A—Proposed Action

4.2.5.1 Geological Hazards

Natural Karst Subsidence

Evaporite karst development is an ongoing natural process in areas where the Rustler Formation outcrops or is very close to the surface west of the project area (Powers and Owsley 2003). Natural karst features include caves, sinkholes, dolines (broad depressions), and collapse valleys (swales). Evaporite karst development is limited within the project area and does not appear to pose a risk to the proposed project facilities. In the project area, the Rustler Formation is deep enough that it is not affected by shallow and surficial hydrological processes that form karst. The geology in the project area has a low potential for the presence of caves and karst according to the BLM. Although there are karst features near the mine area (San Simon Swale and San Simon Sink), there are few documented karst features in the mine area. However, the BLM BMPs and lease stipulations summarized in Chapter 2.0 and listed in detail in **Appendix A** should be followed to protect potential cave and karst resources.

Mining-related Subsidence

The effects of mining subsidence directly associated with the Ochoa Mine would generally be those related to surface topography changes that may affect existing or new facilities and infrastructure if the ground changes are substantial. Facilities that may be adversely affected include surface buildings, roads (especially paved roads), oil and gas wells, pipelines, and other buried utilities. There are five major phenomena in the overburden above a mined out area that can result in damage to surface structures and resources (Van Sambeek 2000).

1. Vertical displacement
2. Horizontal displacement
3. Tilt or slope of ground surface
4. Horizontal strain
5. Curvature or flexure

Specific land changes attributable to subsidence may include the following (Van Sambeek 2000):

- Ground fissures;
- Changes in ground slope;
- Changes in surface water flow direction;
- Disruption of groundwater hydrology; and
- Sinkhole development at the surface.

The angle of influence (**Figure 3.2-11**) or angle of draw is the most important factor in determining the extent of subsidence effects from the area of 90 percent extraction. The limit of subsidence effects determined by the angle of draw provides guidance for the establishment of buffer zones. The magnitude of the angle of draw is a function of several variables including mining method, size of underground opening, and the strength of rocks within the overburden (Ren and Li 2008). Based on historical mining in the northern Delaware Basin in the SPA, angles of draw vary from 9 to 51 degrees (Abel 2008). The overburden above the polyhalite is the upper 250 feet of the Rustler Formation consisting of mainly halite, anhydrite, and dolomite, plus more than 1,000 feet of sandstones and siltstones of the Dewey Lake, Santa Rosa, and Chinle formations (Wells and Drellack 1983). With exception of 100 feet of halite above the polyhalite ore zone, the overburden largely consists of hard rock that is composed of anhydrite, dolomite, sandstone, and siltstone. Abel (2008) contends that a conservative estimate of the angle of draw should not be more than 25 degrees. Therefore, an angle of draw of 45 degrees appears to be very conservative but reasonable.

Argüello et al. (2009) devised a model to determine how subsidence in the subsurface would affect oil and gas well bore casings to provide guidance in the development of buffers for the revision of the 1986 Potash Order. Using mining depths of 1,000 and 2,000 feet below the ground surface, the model assumed that subsidence would cause slippage between layers of rock within areas affected by subsidence. It was assumed that slippage of layers would cause damage to well cement and casing. On the basis of the modeling, Argüello et al. (2009) concluded that “depending on mine depth and mining direction, the distance from the mine boundaries to the points where no slip occurs is between 600 m (~1,970 ft) and 1,100 m (~3,610 ft) from the edge of the mine excavation.” The angles as measured from vertical from the “edge of mine” (no extraction ratio was provided) created by these distances are 63 and 74 degrees, respectively. If these angles correspond to the angles of draw that define the limit of subsidence effects (considering compression and tension forces in the overburden), then they far exceed the angles of draw determined by mining experience in the region.

However, the modeling by Argüello et al. (2009) may have limited application to the proposed Ochoa Mine due to the following factors.

- The model is based on, and was designed, for the stratigraphy and mining in the SPA. In the SPA, numerous potash zones in the Salado Formation are mined and the overburden composition is very different from the proposed Ochoa Mine area. The potash zones targeted in the SPA are in the Salado and begin 500 to 800 feet below the base of the Rustler. The dominant lithology above the potash zones to the base of the Rustler is halite with occasional thin marker beds (Cheeseman 1978).
- The polyhalite zone targeted by the Ochoa Mine is about 300 feet above the base of the Rustler Formation and at least 750 feet above the potash ore zones that are targeted in the SPA. The overburden above the polyhalite is very different from the overburden over the potash zones considered in the model. The model results by Argüello et al. (2009) indicated that the maximum amount of slippage occurred at a marker bed between the potash ore zones targeted in the SPA and the base of the Rustler Formation. This marker bed is in the Salado Formation that would not be affected by the mining of polyhalite because it is deeper than the target polyhalite ore zone in the Ochoa Mine area.
- The other major difference between the SPA and the Ochoa Mine area is in the overburden. In the Ochoa Mine area that there is a thicker section of hard sedimentary rock above the Rustler Formation that does not contain the marker beds identified in the model for the SPA where slippage and subsequent potential damage to well casings occur. The hard rock is likely to react to the stresses to create angles of draw that are much less than the model results up to 74 degrees. In the SPA, those layers of hard rocks are much thinner, and in some places the Rustler Formation is much closer to the surface with only a thin veneer of sedimentary rock or unconsolidated overburden.

To ensure that the 60 percent extraction would not incur subsidence, ICP conducted an analysis that concluded that pillars 116 long and 27 feet wide with a spacing of 13.5 feet would safely support the rocks above indefinitely because the pillar strength is 3.4 times the average load. Although the pillars would be expected to maintain the load indefinitely, maintenance and monitoring would be conducted in areas determined to be high stress (ICP 2012e). Abel (2008) indicated that panels in areas of 67 percent extraction in the Mississippi Potash Mine in the 1950s were still accessible in the 1990s.

Impacts from Subsidence

Effects due to mining-related subsidence would be expected to occur at a distance defined by the angle of influence or angle of draw, which is the angle of inclination from the vertical of the line connecting the edge of the workings and the edge of the subsidence area (angle α in **Figure 3.2-13**). According to Golder and Associates (1979), "the zone of disturbance of strata above the mine workings extends beyond the limit of the mine workings and data from the southeast New Mexico potash fields suggest that a reasonable limit for defining this zone of disturbance would be an angle of 45 degrees from the vertical." When applied to the proposed project, mining that occurs at a nominal 1,500-foot depth would result in a subsidence effects area that would extend 1,500 feet beyond the edge of the mine workings.

Direct effects from subsidence can include pushed up well casings, damaged or failed well casings, cracking and fissuring of the ground, damaged or broken pipelines or other buried utilities (Galloway et al. 2008). Sudden collapse without obvious warning or migration of a void to the surface may occur but it is more likely that subsidence in the project area would be expressed more slowly due to the elastoplastic nature of the salt formations that tend to deform rather than break. Indirect effects often include alteration of surface drainage commonly resulting in impoundment of runoff or "sinking streams," disruption of shallow groundwater tables, livestock or wildlife loss, and public safety hazards. Components of the proposed project most at risk would be facilities such as wells, water pipelines, lined ponds, and roads. For the current land uses in the project area, potential subsidence is most likely to affect roads, pipelines, and structures, and may cause the diversion of surface water runoff with the greatest noticeable disruption occurring where tensile strains result in surface fissures.

Structures. Horizontal strain or ground movement can be the most damaging to surface structures. Depending on the amount of strain, damage can range from slight and almost undetectable (hairline cracks in plaster) to serious structural damage (leaning walls, distorted window and door frames, and utility pipe damage).

Roads. Subsidence induced effects on roadways can range from minor to extreme. Minor effects can include slight heaving and dropping or lateral shifting of the roadway surface, creating an undulating or irregular horizontal alignment. More extreme effects can include pavement buckling or fracturing as well as failure of the roadway base when subsidence undermines the soils and supporting embankments associated with roadway components.

Oil and Gas Wells. Subsidence-induced deformations of the rock layers can damage oil and gas wells located within the zone of influence. Subsidence effects on such wells can include distortion of the boreholes, squeezing of casing, and shearing of casing. Well damage could lead to the escape of hydrocarbons along bedding planes or up annular spaces in wells into mine workings.

Based on the analysis in the previous section, it can be concluded that the 200-foot no-mining radius with an additional 1,300-foot buffer of lower extraction rate (60 percent) around active oil and gas wells should be adequate to minimize adverse effects from subsidence. Assuming an angle of draw of 45 percent or less for subsidence, minimal or no effects would be expected and the wells would have a margin of safety distance from the maximum stresses that would be encountered inside the angle of draw and the edge of the 90 percent extraction area in the mine.

In addition to these safety measures, ICP intends to operate the Ochoa Mine under rules that apply to gassy mines to lessen the danger in the event of an influx of natural gas into the mine workings (ICP 2011).

Pipelines. The integrity of pipelines and their ability to withstand the effects of surface subsidence is largely based on the inherent flexibility within the line and the manner in which pipe joints respond to angular and telescopic movements. Buried pipelines effectively move when the ground moves.

Therefore, when the ground undergoes a curvature or horizontal change in length, a pipeline may fracture particularly at joint or flange locations. In the case of fixed anchorage aboveground pipelines, subsidence-induced strain may be imposed at the support points and varying degrees of tightness or variances in joint mating surfaces may cause the pipe to crack or break.

Water. The development of tension cracks in the subsidence area can cause the disruption of surface water and groundwater that may be present in the overburden above the mining zone. These effects can include lowering or altering of groundwater levels, changes in surface water runoff direction and flow rate, and changes in water quality. Mining heights in bedded salt layers of less than 16 feet thick are not expected to have an effect on groundwater (Van Sambeek 2000). However, alteration of the ground surface can change surface water runoff quantity and flow direction.

4.2.5.2 Minerals

Hazards Due to Oil and Gas Activities

Within the proposed 50-year mine area including the subsidence area, there are approximately 26 active gas wells, 76 active oil wells, 11 SWD wells, 2 pilot wells, 2 temporarily abandoned wells, and 39 plugged and abandoned (P&A) wells. All the wells were drilled since the 1950s when discovery of deep production of the Bell Lake Unit encouraged operators to develop into the deep basin.

Any condition that allows movement of unsaturated fluids between formations could result in the dissolution of evaporite layers and subsequent subsurface instability, possibly causing ultimate surface collapse (Walters 1978). The major purposes of cementing well casing in place are to prevent the migration of fluids from one zone to another to protect water sources, prevent commingling of hydrocarbons from different zones, prevent the uncontrolled movement of hydrocarbons outside the production casing and tubing, and, where present, prevent the dissolution of evaporite layers.

In the project area, there are a number of aquifers that must be sealed off in oil, gas, or water wells to prevent the migration of fluids. These aquifers include sands in the Dewey Lake Formation and Triassic beds (Santa Rosa Formation) above the Rustler Formation, as well as the Culebra zone within the Rustler Formation.

Oil and gas wells drilled in this area have similar casing and cementing programs. A typical well, regardless of ultimate depth, has a surface casing string set at depths varying from 300 to 800 feet below ground surface, with a requirement to have cement circulated to the surface to ensure that any aquifers behind the casing are sealed. After the surface casing is set, wells are typically drilled to the top of the Bell Canyon Formation of the Delaware Mountain Group at around 5,000 to 5,400 feet below the ground surface.

In the past, the wells were often drilled deep enough to test sands only in the upper Bell Canyon section, in which case the second casing string would have been the production casing. On the other hand, if the intent was to drill deeper, the second casing was set as an intermediate string in preparation to drilling to targets located at depths from 12,000 to 17,000 feet. In either case, if cement was not placed from the casing point to the surface or to a depth above the bottom of the surface casing, then there is the possibility that aquifers located below the surface casing may be in communication with salt or anhydrite zones (**Figure 4.2-1**).

Depending on groundwater flow potential, water could flow by gravity out of the aquifers and this hydrodynamic situation behind the uncemented casing could not only cause the dissolution of evaporite layers, but also contribute to casing corrosion. On the left, **Figure 4.2-1** shows an at-risk casing and cement configuration whereby unsaturated fluids from unsealed water-bearing zones can be in possible communication with evaporite layers susceptible to dissolution **Figure 4.2-1A**. This casing configuration also could allow injected or withdrawn fluids to come into contact with evaporites through casing and tubing leaks. On the right, a protective casing and cement configuration where cementing the long casing string to the surface would seal the aquifers and prevent communication between water-bearing zones and evaporites (**Figure 4.2-1B**).

Of the many oil and gas wells that intercept the mining area, only a few of the wells appear to present a risk of unsealed aquifers and unprotected evaporite. The wells listed on **Table 4.2-1** exhibit a casing-cement configuration similar to that shown in **Figure 4.2-1A**. These wells in some cases produced or were operated as injection wells for many years before finally being plugged and abandoned. Over the course of several decades, it is not unreasonable to assume that salt zones in these wells could have been subjected to extensive dissolution and may pose as yet undiscovered hazards to mining, potentially limiting efficient ore recovery. Abandoned wells pose no less a hazard than active wells because annular flow behind production casings may not have been detected during the operational lives of the wells or when the wells were abandoned. The at-risk wells are displayed on **Figure 4.2-2**.

Data from the at-risk wells within 1,500 feet of the proposed 50-year mine area were reviewed. The area within 1,500 feet of the proposed mine boundary is of concern because subsidence effects from potential voids caused by dissolution of evaporite rocks along the wellbores could extend into the mining area. Most of the at-risk wells in the potential subsidence area had similar casing and cementing programs that left potentially unsealed aquifers and large intervals of evaporites unprotected by cemented casing. These wells were included in **Table 4.2-1** to identify where monitoring and possible mitigation may be needed to minimize adverse impacts described in this section such as the dissolution of evaporite layers or oil or gas entering the mine due to poorly stabilized existing wells.

Wells having an at-risk casing and cement configuration may present a hazard to underground mining as well as the risk of development of sinkholes. The at-risk designation is not meant to indicate with certainty that problems exist or would occur, but is intended to identify a potential problem for planning purposes. It is based on a review of records available in the online OCD database and identification of casing and cementing configurations that may present problems. The movement of fluids out of a water-bearing zone is not likely if groundwater conditions or rock properties allow little or no fluid flow out of the rock. Identification of certain attributes of well construction that could allow migration of fluids is consistent with the observations and conclusions of researchers who have studied the catastrophic subsidence associated with oil field practices (K.S. Johnson et al. 2003; Powers 2003) and provides the basis for the at-risk designation.

<u>Oil and Gas Wells and Processing Plant Facilities</u>

Table 4.2-2 lists five oil and gas well surface locations that are within the proposed processing plant site boundary for the Proposed Action. Two of the wells are located in the area designated for the tailing stockpile. The remaining three wells do not appear to conflict with the proposed locations of the processing buildings, ponds, or tailings stockpile. Although the Triste Draw 26 Federal #2 was plugged and abandoned, any surface disturbing activities in the area of the well would have to maintain the integrity of near-surface plugs. With the assumption that ICP and the oil and gas well operators would negotiate surface use conflicts and access to remaining wells within the fenceline of the processing plant site would be allowed by ICP, no further mitigation is recommended.

4.2.5.3 Paleontological Resources

Due to the low PYFC of the geologic formations and few documented paleontological resources in the project area, the potential for adverse impacts to paleontological resources is low under the Proposed Action. If fossils were found, the BLM must be contacted immediately to allow a determination of whether the fossils are scientifically significant and to provide a qualified paleontologist to assess and document the find. If fossils are collected, they would be curated at a facility approved by the BLM.

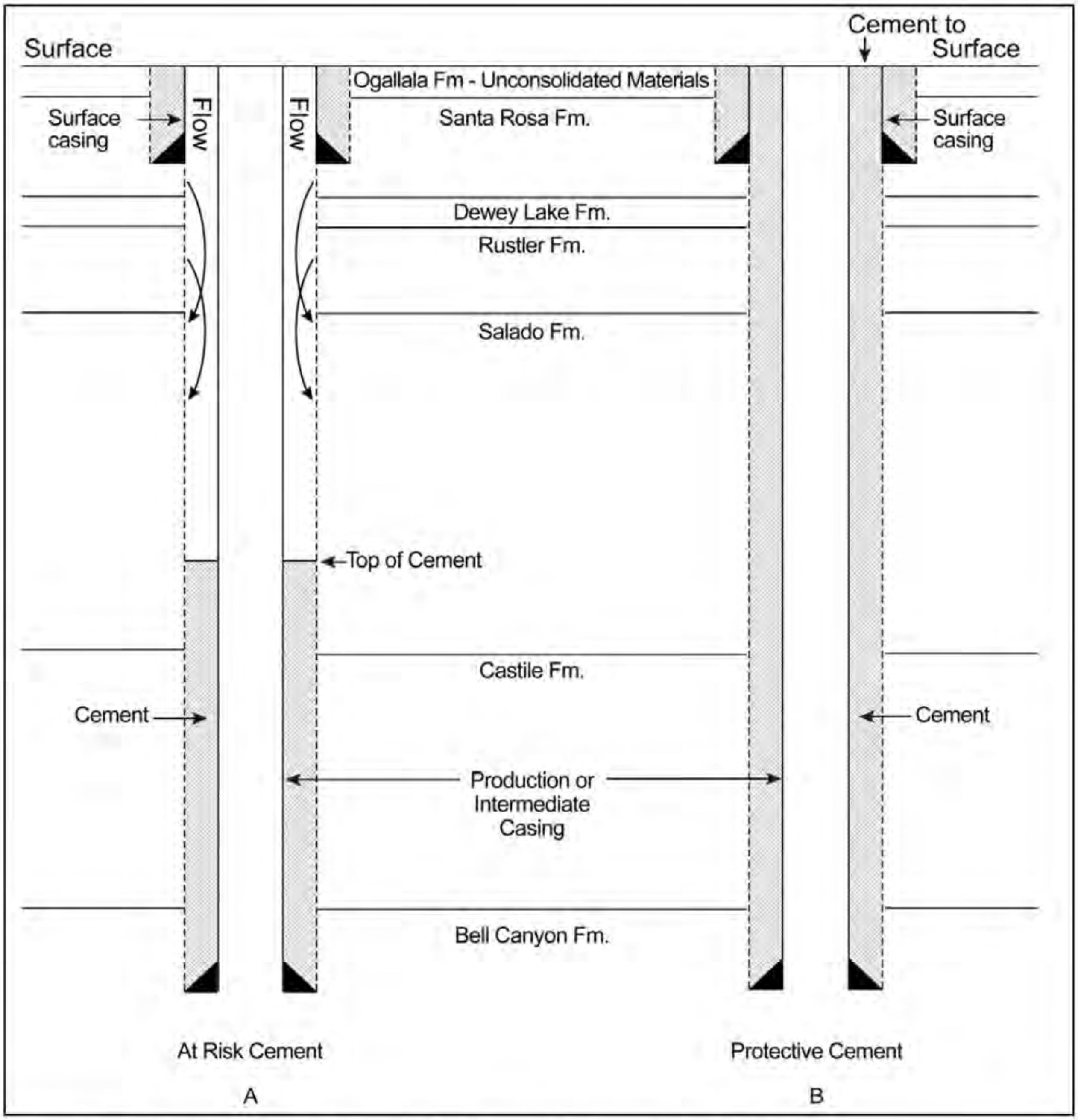


Figure 4.2-1 Typical Oil and Gas Well Casing and Cementing in Project Area

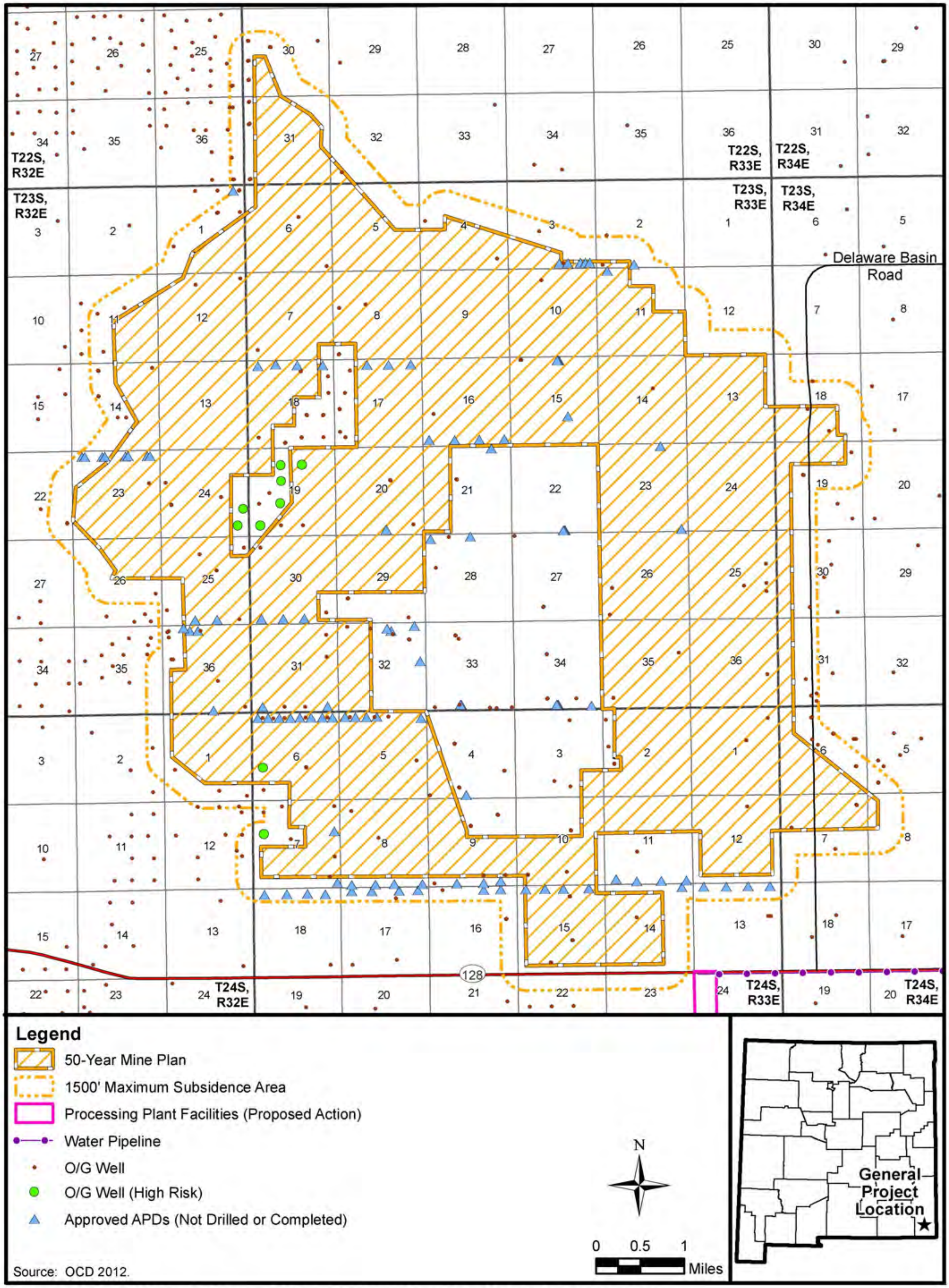


Figure 4.2-2 Wells, APDs, and High Risk Wells within the Subsidence Area

Table 4.2-1 List of At-risk Wells Within and Adjacent to Proposed 50-Year Mine Area

API #	Location Section-Township-Range	Type[1]	TD[2]	Year Comp	Status[3]	Surface Casing Set (depth in feet)/ Formation	Production/ Intermediate Casing Set (depth in feet)/ Formation	Reported TOC[4] (depth-feet)	Comment
30-025-25151	NWNE 19 T23S, R33E	O	5,250	1975	P&A	1,245/Rustler (based on offset well)	5,250/Bell Canyon	3,600	2,355 feet no cement.
30-025-24381	NWSW 6 24S 33E	SWD	5,170	1973	P&A	366/Santa Rosa	5,168/Bell Canyon	3,646	Casing cut at 1,370 feet during P&A, TOC not certain.
Wells Located Adjacent to 50-Year Mine Area (within 1,500 feet)									
30-025-08358	SWSW 19 23S-R33E	O	5,237	1961	ACT	381/Triassic (Santa Rosa?)	5,237/Bell Canyon	4,500	TOC Castile Formation, 4119 feet no cement. Casing leak at 660 and at unspecified depth. Repaired 1972.
30-025- 24432	SWNW 7 24S-33E	SWD	5,204	1973	ACT	421/Santa Rosa	5,204/Bell Canyon	Reported circulated to surface, casing	Injection into perfs at 5012 to 5033 (Bell Canyon). Casing leaks at unreported depths repaired in 1977, 1983.
30-025-08359	NESW 19 T23S, R33E	O	5,216	1961	P&A	380/Triassic (Santa Rosa?)	5,216/Bell Canyon	4,408	TOC Castile Formation, 4,028 feet no cement. Converted to SWD 1985 after casing leaks repaired. Failed mechanical integrity test 2009.
30-025-25000	SENW 19 T23S-R33E	O	5,180	1975	P&A	527/Santa Rosa	5,180/Bell Canyon	2,500	TOC Salado, 1,973 feet no cement.
30-025-25201	NENW 19 T23S-R33E	O	5,235	1976	INA	1,287/Rustler	5,235/Bell Canyon	3,200	TOC in Salado, 1,913 feet no cement.

Table 4.2-1 List of At-risk Wells Within and Adjacent to Proposed 50-Year Mine Area

API #	Location Section-Township-Range	Type[1]	TD[2]	Year Comp	Status[3]	Surface Casing Set (depth in feet)/ Formation	Production/ Intermediate Casing Set (depth in feet)/ Formation	Reported TOC[4] (depth-feet)	Comment
30-025-08119	SESE 24 T23S-R32E	O	5,217	1961	P&A	386/Triassic (Santa Rosa?)	5,217/Bell Canyon	4,275	TOC in Castile Formation, 3,889 feet no cement.
30-025-20153	NESE 24 T23S-R32E	O	5,168	1963	P&A	386/Triassic (Santa Rosa?)	5,168/Bell Canyon	4,650	TOC in Castile Formation, 4,264 feet no cement.

[1] O – Oil; SWD – Salt Water Disposal.

[2] TD – Total Depth (feet).

[3] ACT – Active; P&A – Plugged and Abandoned; INA – Inactive.

[4] TOC – Top of Cement.

Table 4.2-2 Oil and Gas Wells Within Processing Plant Site, Alternative A

API #	Well Name	Well type	Status/Date	Section-Township-Range	Location in Relation to Proposed Surface Facilities	Comment
3002528533	Madera Ridge `25` Fed Com	Oil	Active/2-13	NWSW 25-24S-33E	Within facilities area boundary	P&A 2000; Re-entry 2009; re-completed for oil in Bone Spring
3002534512	Triste Draw 26 Federal #1	Gas	Active/2-13	NESW 26-24S-33E	Within facilities area boundary	Wolfcamp Shale
3002534972	Triste Draw 26 Federal #2	Gas	P&A	SENE 26-24S-33E	Within facilities area boundary	Dry and abandoned, never produced
3002534719	Triste Draw 35 Federal #1	Oil	Active/2-13	SWSW 35-24S-33E	Tailing stockpile area	Originally completed for gas in Wolfcamp; recompleted 2009 for oil in Bone Spring
3002534700	Triste Draw 35 Federal #2	Gas	Active/2-13	SENE 35-24S-33E	Tailing stockpile area	Wolfcamp Shale

Source: OCD 2013.

4.2.6 Alternative B

The risk of impacts to geological resources under Alternative B would be similar to those described for Alternative A, Proposed Action. The primary difference would occur should a portion of the tailings be backfilled in the mine workings rather than stored in the proposed tailings stockpile. If dry tailings are placed into mined out rooms underground, the backfill would have to occur soon after mining is completed because convergence of the mine roof (when the roof deforms into the mined out void) would begin rapidly. After approximately 1 year, there may not be adequate height to safely place tailings into the void. A benefit of backfilling with tailings soon after mining extraction is completed would be that the total amount of subsidence would be less because the backfill would fill in the void and help support the roof and pillars. None of the other tailings management options listed under Alternative B would change the impacts to geology and minerals compared to the Proposed Action. Alternative B would present the same potential surface use conflicts with oil and gas wells Alternative A.

4.2.7 Alternative C

The risk of impacts to geological resources under Alternative C would be similar to those described for Alternative A, Proposed Action. Under Alternative C, the management of potash mining and fluid mineral development would be more clearly and rigorously defined, similar to the procedures followed in the SPA for co-development. It is difficult to predict whether there would be different impacts to geology and minerals under more well-defined standards and guidelines, compared to the Proposed Action. However, it is likely that this alternative would afford the mining and oil and gas industries, as well as the federal and state mineral management agencies (BLM, State Land Office, and OCD), a better basis for future development planning decisions and management of mineral resources by providing more clearly defined policies and requiring regular updates to planning documents. Alternative C would present the same potential surface use conflicts with oil and gas wells as Alternative A.

4.2.8 Alternative D

The risk of impacts to geological resources under Alternative D would be similar to those described for Alternative A, Proposed Action. However, under Alternative D, the location of the evaporation ponds and tailings stockpile would still be in potential conflict with oil and gas well surface locations.

As shown in **Table 4.2-3**, there are six oil and gas well surface locations within the processing plant site boundary for Alternative D. One location (Red Raider BKS State) is located in the proposed evaporation pond area. The Red Raider BKS State well is a re-entry of the Rattlesnake Gulch ‘25’ State and the wells occupy the same surface location. Two wells, the Vaca Ridge 30 Federal and the Diamond ‘30’ Federal, are within the proposed tailings stockpile area. The Vaca Ridge well is a salt water disposal well. Although the Diamond ‘30’ Federal well is plugged and abandoned, any surface-disturbing activities in the area of the well must maintain the integrity of near-surface plugs. The remaining three wells are located within the processing plant site boundary, but do not appear to conflict with the processing plant, ponds, or tailings stockpile. In addition to oil and gas wells, a water storage pit used by an oil and gas company is located in the SESE of Section 25, T24S, R33E. The pit would not be affected by the proposed processing plant buildings, ponds, or tailings stockpile, but is within the area likely to be disturbed during construction. With the assumption that ICP and the oil and gas well operators would negotiate surface use conflicts and access to remaining wells within the fenceline of the processing plant site would be allowed by ICP, no further mitigation is recommended.

Table 4.2-3 Oil and Gas Wells Within Processing Plant Site, Alternative D

API #	Well Name	Well type	Status/Date	Section-Township-Range	Location in Relation to Proposed Surface Facilities	Comment
3002528533	Madera Ridge \`25\` Fed Com	Oil	Active/2-13	NWSW 25-24S-33E	Within facilities area boundary	P&A 2000; Re-entry 2009; re-completed in Bone Spring
3002529141	Red Raider BKS State	Oil	Active	NWSE 25-24S-33E	In evaporation pond area	Re-entry of Rattlesnake Gulch \`25\` Bone Spring
3002529141	Rattlesnake Gulch \`25\` State	Gas	P&A/1988	NWSE 25-24S-33E	As above	Morrow gas
3002528873	Vaca Ridge 30 Fed Co	Salt Water Disposal (SWD)	Active/2-13	NENW 25-24S-33E	Tailings stockpile area	Originally completed Morrow gas 1985 SWD 1994
3002529210	Diamond \`30\` Fed	Gas	P&A/1986	NWSE 30-24S-34E	Tailings stockpile area	Dry and abandoned; never produced
3002527997	Madera \`29\` Federal	Gas	Active/2-13	NESW 29-24S-33E	Within facilities area boundary	Morrow gas
3002539560	Falcon 25 Federal	Oil	Active/2-13	NWSE 25-24S-34E	Within facilities area boundary	Bone Spring

Source: OCD 2013.

4.2.9 Preferred Alternative

The risk of impacts to geological resources under the Preferred Alternative would be similar to those described for the Alternative A—Proposed Action. Should tailings be placed as backfill into the mine, less subsidence in the mine areas with higher extraction rates would be expected. The enhanced co-development practices, implementation of detailed monitoring plans, and improved communications would be expected to allow for better coordination with stakeholders who own or manage infrastructure (wells, pipelines, roads, structures) within the potential subsidence area.

4.2.10 Mitigation Measures

Recommended additional mitigation measures to minimize project-related impacts are listed in the following sections. These measures are recommended in addition to the BLM requirements and applicant-committed environmental protection measures described in Chapter 2.0, Section 2.4.7.

4.2.10.1 Subsidence

The Ochoa mine plan (ICP 2011) indicates that subsidence monitoring would occur, but does not provide details on where measurement stations would be placed, when measurements would periodically occur, or when monitoring would start. It is recommended that ICP set up the network and begin monitoring with enough lead time prior to mining to provide adequate baseline data for the area.

Given that the subsidence incidents at the Jal and Wink sinks are suspected to have been associated with well integrity problems (casing and tubing corrosion allowing unsaturated fluids to circulate and dissolve evaporite layers) and because the source water well field for the Ochoa Project would be operated for 50 years, it is recommended that the source water production wells be integrity-tested at regular intervals to ensure that unsaturated fluids do not migrate from the wells. The specific testing procedures and time intervals should be determined by the BLM in consultation with the New Mexico State Engineer’s office, but oversight and record keeping would be the responsibility of the BLM.

4.2.10.2 Oil and Gas Production and Proposed Polyhalite Mining

It is recommended that a monitoring plan be developed and implemented to assess potential ground instability in areas where the at-risk wells are located. The well monitoring could be done in conjunction with the subsidence monitoring network. However, monitoring for instability around at-risk wells might involve the use of additional equipment such as tiltmeters, aerial photography, and interferometric synthetic aperture radar to detect subtle changes in ground elevations. The specific survey methods would be determined by ICP in consultation with the BLM. The area around active wells also should be monitored for potential instability during and after mining.

To minimize the potential problems related to ground stability near the wells, the Ochoa mine plan (ICP 2011) provides the methodology for treatment. ICP’s recommended procedures to deal with abandoned wells may need to be modified to account for the actual condition of wells that have been plugged and abandoned. A common abandonment procedure is to salvage casing strings where they can be easily removed, except for surface casing. Because the surface casing is cemented to the ground surface, it is left in place and cut off below the ground. The intermediate or production strings are removed where they can be cut. In the case of an at-risk casing and cementing configuration, the top of the cement provides a convenient place at which to cut the casing. After the casing is cut and removed, cement plugs are then placed at discrete intervals. The cement plugs do not cover the entire hole but are placed strategically over intervals that need to be isolated to create a barrier to flow. Therefore, if an abandoned well is drilled out, there may be no casing to test or to run cement bond-detection tools, as proposed by ICP. If such an abandoned well has no long string casing to clean out and test, and if the well has been determined to pose a risk to mining, the only remedy is re-drilling and placing new plugs according to regulatory agency instructions.

Plugged and abandoned wells with intact casing, wells that are not abandoned but have been idle for extended periods of time, and active wells would be more amenable to the procedure proposed by ICP. Presumably the wells would be accessible and pressure testing and cement bond logs could be run to evaluate well integrity.

4.2.10.3 Potential Karst Hazards

There is a concern that the Bell Lake Sink and other depressions in the proposed 50-year mine area and within the boundaries of the processing plant site for Alternative D may be natural karst features indicative of potentially unstable subsurface conditions. However, review of selected well logs over the mine plan area did not indicate stratigraphic thinning in the Rustler, or thinning in the Rustler-Salado-Castile section. There is no strong evidence of these features having originated by dissolution of subsurface evaporites. Without a definitive explanation of the origin of these features, the presence of topographic depressions over the proposed mine area and under the evaporation ponds proposed for Alternative D poses concerns for potentially unstable and adverse subsurface conditions.

It is recommended that a detailed correlation study be conducted of the geologic section from the surface to the top of the Bell Canyon Formation. Using information from wireline geophysical well logs, it would be possible to assess if there are any abrupt changes in thickness, the presence of intervals that may indicate breccia zones, and the continuity of the Dewey Lake and Santa Rosa formations.

Geophysical surveys to detect karst formation are not recommended at this time. Various geophysical survey methods were evaluated extensively when planning the WIPP facility, but all were rejected due to limitations that resulted in unacceptably ambiguous results in an effort to detect karst features (USEPA 2006b). It is assumed that, because the WIPP site has similar geology to the mine study area, geophysical surveys would not be able to reliably identify karst features. ICP conducted geotechnical testing at the locations of the mine shaft, access ramp into the mine, and the processing plant site proposed under Alternative A. Prior to final design of the evaporation ponds and tailings stockpile proposed under Alternative D, additional geotechnical investigations would be required to ensure the stability of the land if this alternative is selected. If the geotechnical investigations document subsurface instability of the geology, then the ponds and tailings locations must be moved to avoid unstable areas.

4.2.10.4 Paleontological Resources

Because of the low potential for valuable fossil resources to be present, no pre-construction or ground disturbance surveys are recommended. However, the following measures are recommended to minimize potential adverse effects to paleontological resources:

- Construction and mining personnel should be instructed about the types of fossils that could be encountered and the steps to be taken if they uncover potentially significant fossils during construction of the project. Instruction will emphasize the non-renewable nature of paleontological resources and that collection or excavation of fossil materials from federal land without benefit of a federal permit is illegal.

4.2.11 Summary of Impacts

Most impacts to geology and minerals would be similar across all action alternatives (Alternatives A, B, C, D, and Preferred Alternative). There would be a beneficial impact of recovering potash reserves in compliance with BLM policy and federal law. There is a concern that projected subsidence could cause old, improperly plugged oil or gas wells to leak or be a conduit for fluids to enter the evaporite zones or the mine. This would be minimized by the implementation of the mitigation measures proposed in Section 4.2.8. Potential conflicts between mining and oil and gas interests would be minimized by management of co-development through the implementation of the measures described in Section 2.4.2.10. No significant adverse impacts to mineral resources would result, and there is a low risk of adverse impacts to fossils.

Topographic depressions and karst features do not appear to pose a large risk to proposed mining facilities under all alternatives, but it is recommended that the proposed mine area be studied for the presence of potential natural karst processes before mining begins. There is a greater potential for the topographic depressions to adversely affect some of the processing facilities proposed under Alternative D, requiring further geotechnical investigation before final designs can be prepared.

Development of karst features is a natural process that can be accelerated by human activities. It is expected that the risks and concerns related to karst formation would continue well beyond the life of the proposed project. Protective measures would reduce the risk, but cannot be fully mitigated or avoided.

4.2.12 Cumulative Impacts

The cumulative effects study area includes the geologic formations outside of the SPA in the vicinity of the proposed project. This area is geologically different from the location of the other potash mines to the west (within the SPA) where the Rustler Formation outcrops and is much more likely to have caves and active karst features causing subsidence. Due to the low potential for the development of karst features in mine area, the development of sinkholes is unlikely but may be possible if SWD wells are developed and not well protected from the movement of fresh water along the casing. Other geologic hazards, such as subsidence, are unlikely to occur from activities other than the proposed mine.

The interest in oil and gas targets within and near the Ochoa Mine project area would contribute to cumulative impacts to mineral resources and may affect future mine plans should the proposed mining project be approved. The approved but undrilled APDs shown in **Figures 3.2-8** and **3.2-9** can be considered reasonably foreseeable for future oil well drilling within and near the project area. Successful coordination and management of co-development of mineral resources would be important to minimize conflicting mineral development opportunities within the region.

4.3 Water Resources

4.3.1 Surface Water

4.3.1.1 Issues

Project issues related to surface water resources include the potential for:

- Contamination of scarce potable water supplies or existing surface water features caused by leaks or spills from evaporation ponds, settling ponds, or other project components.
- The nature of and disposal of waste water.
- Impacts to other water uses in the area.
- Alteration or removal of existing surface drainage features by project infrastructure.
- Accelerated water erosion along roads, pipeline routes, and at the mine and associated surface facilities.

4.3.1.2 Method of Analysis

Potential impacts to surface water resources were by identified by comparing the locations of these features (arroyos, ponds, and others described in Section 3.3) to the surface disturbance proposed under the EIS alternatives. A review of the proposed water supply and uses, runoff management, and process flow (supply, conveyance and storage, use and disposal) also was conducted using the Ochoa Project Mine Plan of Operations (ICP 2011). Project review also included examination of the Carlsbad BLM RMP (BLM 1988), and public scoping comments. Environmental protection measures are summarized in Chapter 2.0, Section 2.4.7.

This information and the known occurrence and characteristics of surface water resources (Section 3.3) were compared to identify potential impacts based on the issues listed above.

4.3.1.3 Assumptions

The following assumptions were used in the surface water impact assessment:

- Areas of recently disturbed ground would be more susceptible to erosion.
- Site-specific erosion, sediment, and storm water management plans would be developed and implemented prior to start of construction.
- Other fluid or waste management plans and corresponding practices would be implemented in accordance with applicable regulations and proposed site plans. These would include a spill prevention and containment plan (SPCC) per Section 5.8 of the Mine Plan of Operations (ICP 2011), pollution removal, and other solid and hazardous material management programs.
- As described in Section 4.1.3 of the Mine Plan of Operations, rainfall runoff and run-on will be managed by constructing protective berms around all disturbed areas and surface facilities at the mine site, and at the rail loadout in Jal. Berms will prevent clean water run-on from entering mine facilities, and contain any rainfall runoff that has been in contact with mine facilities and materials.
- All pond capacities and integrity would be periodically monitored. Remedial actions would be immediately implemented if pond capacities were found to be reduced below their design parameters, or if embankments or liners were found to be compromised.
- Additional environmental protection measures summarized in Chapter 2.0, Section 2.4.7, would be applied and maintained throughout the project life.
- Erosion from disturbed areas would be minimal once vegetation or other surface stabilization is established. Successful establishment of herbaceous vegetation generally takes a minimum of 3 to 5 years with active irrigation and monitoring.
- Long-term reclamation and stabilization features are those that would successfully contain or control surface water run-on, runoff, and water erosion for a minimum of 100 years.
- All measures listed in Section 2.4.7 that are appropriate to each site would be implemented and maintained.

Impacts to surface water resources would be considered significant if the Proposed Action or alternatives result in one or more of the following:

- Project infrastructure modifies the existing surface drainage features so that increased surface water flows create offsite damage to existing surface water drainages, adjacent land, or affect watershed conditions.
- Discharge from detention ponds and other project structures increase surface water flows offsite and cause downstream erosion.

No federally delineated floodplains (Flood Hazard Zone A as identified by FEMA) occur within or adjacent to the project area so impacts to floodplains will not be discussed further in this section.

4.3.1.4 No Action Alternative

Under the No Action Alternative, the proposed project would not be approved. Existing surface water resources within the project area would remain in their current condition, and would maintain existing variations and trends.

4.3.1.5 Alternative A—Proposed Action

Access Roads and Pipelines

When precipitation occurs, storm water runoff, sediment, turbidity, or salinity could increase from the proposed new access roads. Construction of new access roads and installation of new pipelines have the potential to redirect the natural flow patterns of surface water runoff due to road ditches and culverts. According to the description of the Proposed Action in Chapter 2.0, roads would be constructed following BLM requirements to avoid or minimize impacts to surface water such as increased erosion, sedimentation, and major changes to storm water flows. If brackish well water were used for dust suppression during road or pipeline construction or maintenance, salinity concentrations may increase on watershed surfaces and along ephemeral drainages. Depending on the number of applications and road surface conditions, the increased salinity could adversely affect runoff water quality from roads.

Following project completion, roads would be removed and reclaimed according to agency guidance and ICP's reclamation plan. Little or no impacts to surface water resources are anticipated from roads after they are reclaimed.

The proposed water supply pipeline would be buried a minimum of 2 feet and carry brackish water from the well field to the processing plant site point-of-entry. At drainage crossings, the pipe could become exposed from vertical scour or lateral channel migration over time. If the water supply pipe failed due to channel shifts or other factors near a drainage crossing, brackish water would spill into a watercourse and flow downstream. Frequent monitoring of the water supply pipeline route would identify pipeline instability before it adversely affects surface waterbodies and drainages.

Processing Plant

The central part of the proposed process facility in Section 35 would intersect several small ephemeral channels. Construction regrading through these existing small dry washes would create only minor impacts to the drainage network. The processing facility is essentially located along the divides between three small watersheds (Double X Ranch, Diamond and a Half Ranch, and Woodley Flat, shown on **Figure 3.3-1**). Runoff peaks and volumes from the existing drainage area generally would be small under all but the rarest events. All storm water runoff would be controlled according to the storm water management plan that would be required by the BLM.

Implementation of BMPs would minimize adverse surface water impacts from storm water runoff during construction. During operations, potential adverse impacts to existing surface water resources from ruptures or spills from evaporation ponds would be prevented by the proposed pond designs and periodic monitoring and maintenance. If spills or leaks occur, spill response practices and clean-up in compliance with federal and state spill prevention plans would avoid or minimize adverse impacts to surface water features.

During reclamation, pond materials, liners, and berms would be removed in accordance with applicable regulations and accepted practices. The pond site would be regraded to the approximate original contour, topsoiled, and revegetated. Under these conditions, little or no adverse impacts to surface water resources are anticipated.

Upstream surface water would be diverted around the dry stack tailings stockpile by the proposed storm water management controls and the berm around the tailings pile. Precipitation falling on the tailings stockpile would be detained before leaving the Plant Site by two ponds, one to collect the leachate from the tailings pile and one to detain storm water from a large rain event. The detention pond would control runoff from the tailings stockpile before it flows offsite so that the discharges would be reduced to approximately current conditions. This would minimize the potential for offsite erosion and increased surface water flows.

ICP's proposed long-term reclamation and stabilization of the dry stack tailings stockpile through the addition of soil and vegetation should be adequate to keep the stockpile stable once vegetation is successfully established.

Ensuring the long-term drainage stability of the dry stack tailings stockpile would require repeated inspection and maintenance, or more substantial closure and reclamation provisions.

Mine Area Structures and Waste Rock Piles

Storm water management would be implemented to control surface water runoff around buildings, the shaft, ramp, and waste rock piles so there would be no offsite impacts to surface water resources. All surface structures would be removed and the site graded and revegetated following project completion.

Jal Loadout Facility

Storm water management at this facility would comply with applicable NDPES permit requirements during construction and operations. The finished SOP would be stored in covered buildings so there would be no impact to surface water resources from precipitation.

The lined evaporation pond would collect all wastewater as well as any runoff from the disturbed area. The evaporation pond capacity would be sufficient to capture all storm water runoff from the disturbed area (175 acres) from a 100-year storm event and minimize the rate of offsite discharge. The proposed pond at the loadout would be located approximately eight miles north of the most populated parts of Jal, and approximately 2.5 miles from any notable system of ephemeral draws draining to the south. Based on this setting and the capacity of the evaporation pond, there would be little risk to Jal from a spill or failure at the structure.

Compliance with the SPCC Plan requiring containment and prompt cleanup would minimize the risk of adverse effects to surface water drainages in the event of a spill of hazardous or harmful chemicals stored at the loadout.

4.3.1.6 Alternative B

Under this alternative, the volume or height of the dry stack tailings facility would be reduced by at least 30 percent from the Proposed Action. The general features of the facility (lining, berms, sideslope configuration, reclamation approach) would be similar to the Proposed Action. The sideslopes of the tailings stockpile at the end of the project may be less susceptible to erosion than under the Proposed Action because the slopes would be shorter and more easily stabilized with soil and vegetation.

Under Alternative B, the tailings stockpile may have a smaller or larger footprint. The smaller footprint, and less total surface disturbance, may result if marketable products were removed from the processing waste stream, removed from the stockpile on a regular basis, or backfilled in the mine. The larger footprint, resulting in more surface disturbance, would occur if the stockpile height were reduced while storing the same amount of tailings as under the Proposed Action (Alternative A). For example, the tailings stockpile as proposed under Alternative A has a footprint of 3,909 feet by 4,732 feet (approximately 425 acres) with a height of 200 feet. If the volume of the stockpile remains the same but the height is reduced by 30 percent to 140 feet, then the footprint would need to be 4,376 feet by 5,393 feet (approximately 542 acres). However, in order to develop a more natural configuration of the dry stack tailings stockpile with a lower top elevation, it would most likely be necessary to extend the footprint beyond the currently proposed processing plant site boundaries. The potential extension of the dry stack tailings facility southward into state lands on Section 2, T25S, R33E, would not affect any known surface water resources.

Changes in the footprint would require a different detention pond design and a different storm water management plan than would be developed for the Proposed Action, but these storm water controls would minimize adverse impacts to surface water features in any case.

4.3.1.7 Alternative C

No differences to potential surface water impacts would result from Alternative C in comparison to Alternative A, Proposed Action.

4.3.1.8 Alternative D

Potential impacts to surface water from implementation of Alternative D would be the same as those from Alternative A for the mine area structures and waste rock piles, the Jal loadout facility, and most access roads and pipelines. Under Alternative D, a portion of the evaporation ponds and tailings stockpile would occupy most of a playa located primarily in the northeast corner of Section 25, T24S, R33E. The playa is approximately 40 acres in size, with small portions extending to the north, northeast, and east beyond the boundary of the proposed processing plant site. Two smaller playas, each less than 5 acres in size, also would be occupied by facilities in Section 30, T24S, R34E. Several ephemeral drainage networks flow southward from the proposed processing plant site location, and cross the existing road along the southern perimeter of the boundary.

Under Alternative D, the same environmental measures described for the Proposed Action would be implemented to avoid or mitigate potential impacts to surface water resources. Measures would include implementation of BMPs, diversion of surface water and detention of runoff by storm water management controls and berms, and long-term reclamation and stabilization of the dry stack tailings stockpile.

The placement of facilities on the playas and adjacent to defined ephemeral drainage networks would remove these water resource features from their existing beneficial uses and increase the potential for damage to project components and downstream land uses from severe runoff events. Playas in the southern High Plains region provide important wildlife habitat (Bristol 1998; Hall et al. 1999; Irwin et al. 1996), and may serve as points of groundwater recharge (Davis and Hopkins 1993).

Alternative D would create adverse impacts to these other water uses in the area by removing or greatly altering the existing surface water features. In addition, because the playas and ephemeral drainages detain or route runoff from severe storms, stabilizing the evaporation ponds and tailings stockpile during operations would require installation of more substantial storm water management under Alternative D than under the other action alternatives. The overall risk of infrastructure damage and offsite storm water discharges from severe runoff events would be greater under Alternative D, particularly during the long-term post-reclamation period. If process fluids or materials were released offsite, adverse erosion, sedimentation, and water quality impacts could occur downstream. These are likely to be significant adverse impacts to surface water resources and related existing uses.

4.3.1.9 Preferred Alternative

Surface water impacts would be similar to those described for Alternative A, Proposed Action. The primary difference from the Proposed Action would occur if, as described for Alternative B, the tailings stockpile had a smaller footprint (due to selling marketable products and backfilling in the mine) because there would be less total surface disturbance.

4.3.2 Groundwater

4.3.2.1 Issues

Issues related to groundwater resources that have been identified for the proposed project include:

- Possible shallow groundwater contamination from proposed ponds and tailings stockpile associated with the project.
- Drawdown of groundwater levels through pumping for proposed mining operations.
- Potential change in groundwater contributions to the Pecos River.

4.3.2.2 Method of Analysis

Evaluation of potential impacts to shallow groundwater was performed qualitatively, using the knowledge of the shallow groundwater systems and an understanding of the design features and monitoring system proposed by ICP.

Impacts to groundwater quantity (water levels) within the Capitan Aquifer, groundwater influx from the Delaware Basin, and potential impacts to the Pecos River were estimated using a numerical groundwater flow model. Potential impacts to the Artesia Group aquifers in the backreef were estimated analytically. The models were developed by INTERA for ICP (INTERA 2013). No impacts to water quality were modeled. The model domain, the area of the Capitan Aquifer covered by the groundwater model, is shown in **Figure 4.3-1**. More details on the groundwater modeling can be found in the modeling report prepared for the project titled "Hydrogeologic Impact Assessment Ochoa Mine Project, Lea County, New Mexico" (INTERA 2013). This section summarizes the key features of the models created to evaluate impacts, the calibrated model and the predictive model.

<u>Calibrated Model</u>

Following development of the conceptual model, a single-layer, two-dimensional conceptual model was created to characterize the Capitan Aquifer and its hydrologic interaction with the Artesia Group, the San Andres Formation, the Pecos River, and the sedimentary formations of the Delaware Basin. The model encompasses the Capitan Aquifer, interactions with the Pecos River, and groundwater influx from the San Simon Channel, the Sheffield Channel, and the Glass Mountains. The Capitan Aquifer has limited interaction with the backreef Artesia Group outside of the two paleochannels and limited interaction with the aquifers in the Delaware Basin. Groundwater influx from the Delaware Basin to the Capitan Aquifer is included in the calibrated model. The San Andes Formation, a member of the Delaware Mountain Group, is hydraulically connected to the Capitan Aquifer in the model.

The numerical groundwater model treats the Capitan Aquifer as a single confined aquifer unit and models the aquifer as a two-dimensional confined aquifer. This results in a one-layer model for the Capitan Aquifer. The thickness of the Capitan Aquifer, as modeled, ranges from less than 500 feet in the area of the Laguna submarine canyon to a maximum of approximately 2,500 feet (**Figure 4.3-2**). The modeling code employed by INTERA (2013) was MODFLOW 2000 (Harbaugh et al. 2000) and the modeling platform was Groundwater Vistas 6.0 (ESI 2007). The model grid was a constant 2,000 feet by 2,000 feet over the entire model domain. The calibration period used in the numerical model was from 1967 to 1972 within the period of high oil and gas pumping from 1965 to 1972 (Hiss 1975).

The model domain for both the Capitan Reef and backreef are shown in **Figure 4.3-1**. The Glass Mountains were assumed to be the principle zone of recharge to the Capitan Aquifer east of the Pecos River. This recharge was estimated at 3,482 afy using the methodology found in Standen et al. (2009) and adjusted during calibration to a final value of 1,780 afy (INTERA 2013).

The eight hydraulic conductivity zones shown in **Figure 4.3-3** were selected based on areas of similar thickness in the Capitan Aquifer (INTERA 2013). In the area of the proposed well field, which is in the northern part of hydraulic conductivity Zone 5, the horizontal hydraulic conductivity was based on a two-well aquifer test conducted by INTERA (2012) using two of the eight planned production wells. The two wells located on **Figure 2-4** (ICP-WS-01 and ICP-WS-02) were installed by ICP during 2012 for aquifer testing, the results of which were used to develop and calibrate the model. These wells were approximately 1,500 feet apart, over 5,000 feet deep, and had an average estimated horizontal hydraulic conductivity for the Capitan Aquifer of 7 feet/day. For hydraulic conductivity Zone 1 at the Pecos River, the value of 5 feet/day used by Barroll et al. (2004) was employed and was not adjusted during

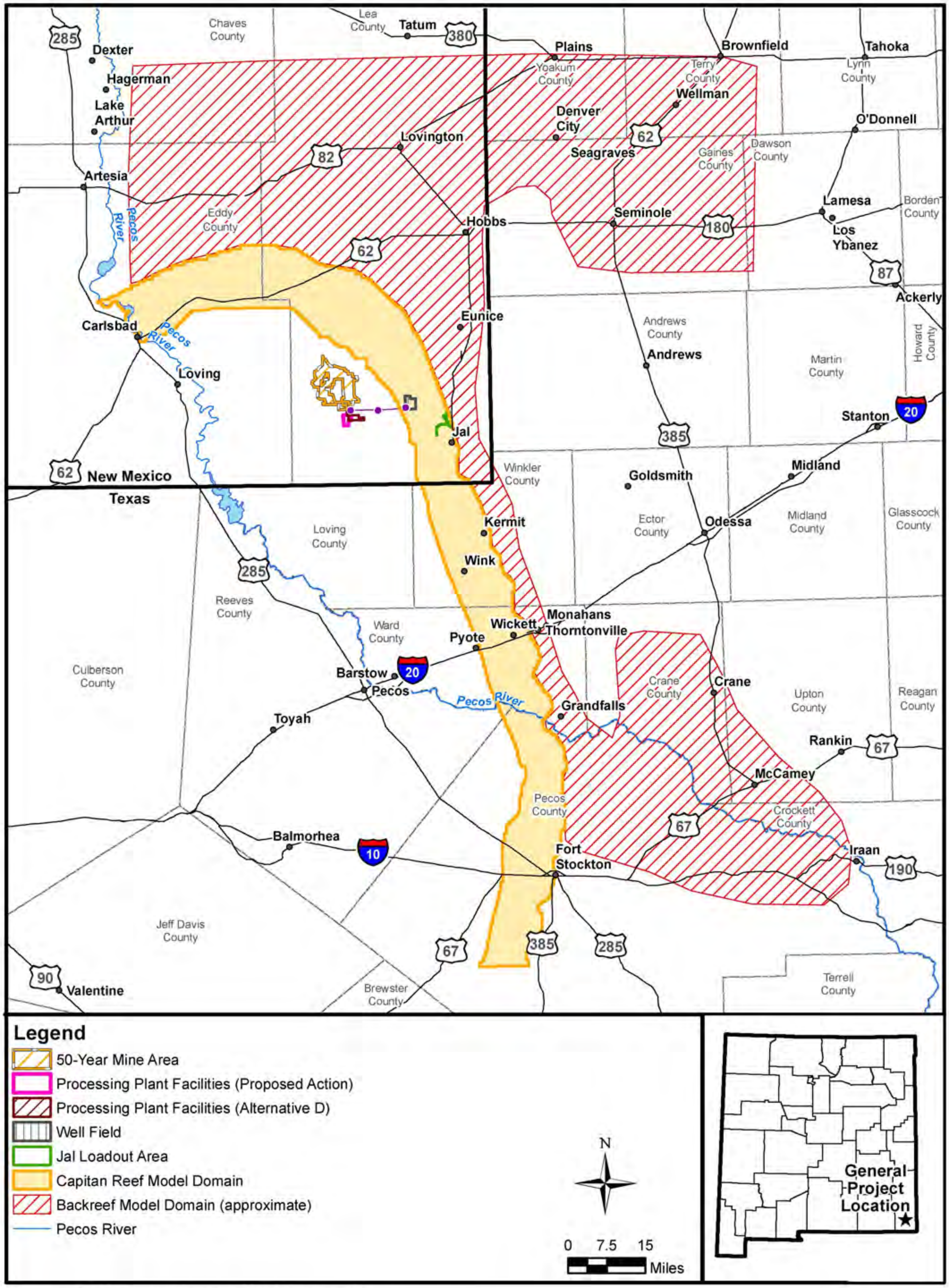


Figure 4.3-1 Groundwater Model Domain

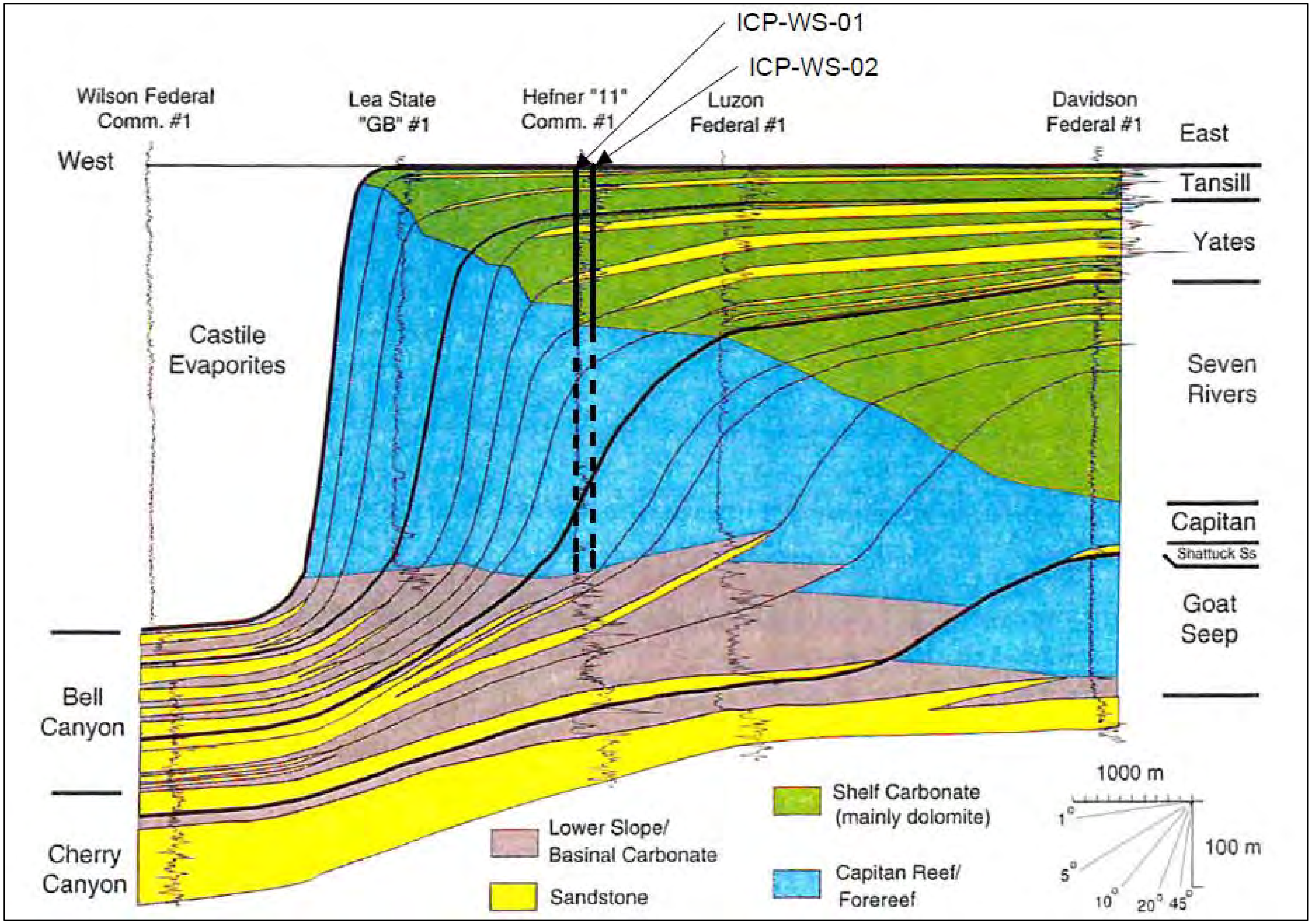


Figure 4.3-2 Cross-section of Geology at ICP Test Wells and Approximate Screening of Well Casings

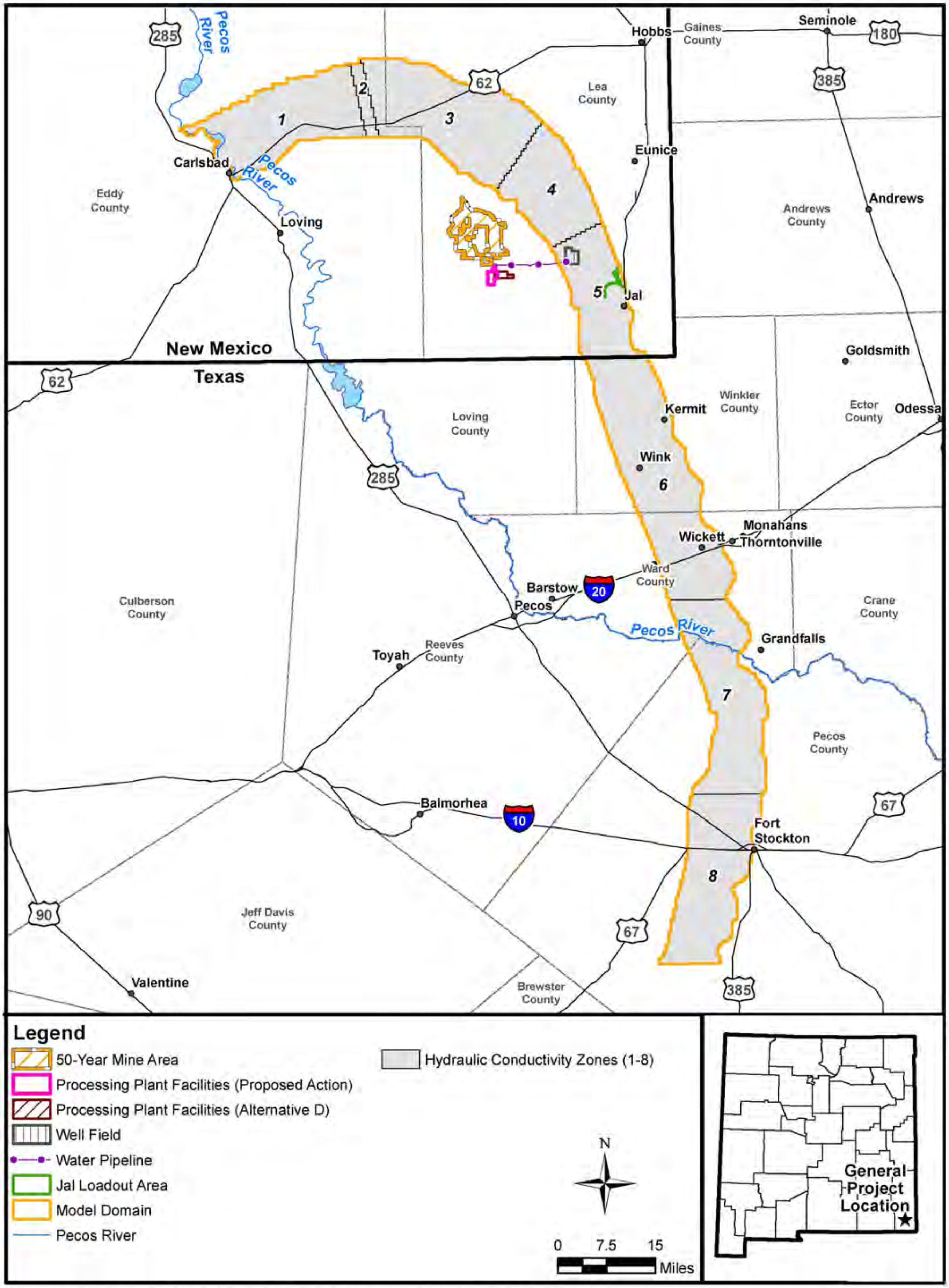


Figure 4.3-3 Hydrologic Conductivity Zones in Capitan Model Domain

calibration. For the zone of low permeability near the Eddy/Lea county line associated with the Laguna submarine canyon (a north-south underground feature located along the Eddy/Lea county line), the horizontal conductivity was limited on the lower range to 0.005 feet/day, based on drill stem tests reported by Harris and Saller (1999) for a petroleum well screened in the lower part of the Capitan Limestone. All other hydraulic conductivity values were adjusted during calibration.

Five boundary conditions were employed in the groundwater model: (1) the boundary at the Pecos River; (2) the boundary of the Capitan Aquifer with the Delaware Basin; (3) the boundary of the Capitan Aquifer with the back-reef Artesia Group and San Andres Formation; (4) the boundary between the San Simon and Sheffield Channels and the Capitan Aquifer: and (5) the boundary with the Glass Mountains at the southern end of the model domain (**Figure 4.3-4**). The boundary with the Pecos River was set up as a specified head boundary in the calibrated model, based on the average water level in the City of Carlsbad Well 13 from the period from 1967 to 1972. The boundary with the Delaware Basin was set up as a specified flux boundary in the calibrated and predictive models, but was set up as a no-flow boundary in the steady-state (No Action) model due to the low flow of water coming from the basin into the Capitan Aquifer (INTERA 2013). The boundary with the Glass Mountain was set as a specified flux boundary.

For the contact between the Capitan Aquifer and the backreef Artesia Group, INTERA employed a no-flow boundary for the contact between the Capitan Aquifer and the backreef except for the San Simon Channel and the Sheffield Channel (INTERA 2013). The boundary between the San Simon and Sheffield channels and the Capitan Aquifer was set up as a specified flux boundary based on separate one-dimensional modeling of the change in gradient. The channels and other structural features related to the Capitan Reef are displayed on **Figure 4.3-5**.

Model calibration was performed manually and with the automated calibration program PEST (Watermark Numerical Computing, 2005). Only hydraulic conductivity values in hydraulic conductivity Zones 3 through 8 were varied during calibration, and the hydraulic conductivity in Zone 2 was not allowed to fall below 0.005 feet/day (INTERA 2013).

The calibrated model represents the time period from 1967 to 1972, when the oil and gas well fields of west Texas, in the area around Kermit and Wink (Zone 6, **Figure 4.3-3**), were very active and pumping water from the Capitan Aquifer. During this time period, the pumping of water for oil and gas development ranged from a volume of 9,744 to 17,640 afy with an average over this period of 11,844 afy (INTERA 2013). The removal of this volume of water caused an influx of water from the Delaware Basin, the Sheffield Channel, and the San Simon Channel into the Capitan Aquifer. Water in the Capitan Reef Aquifer also was recharged from the Glass Mountains and the Pecos River. A comparison of the inflow and outflow indicates a total loss of water from the Capitan Aquifer of about 2,831 afy during the period of west Texas oil and gas pumping. The water levels and maximum drawdown predicted by the calibrated model are displayed in **Figures 4.3-5** and **4.3-6**, respectively.

The hydraulic conductivity zones were selected based on areas of similar thickness in the Capitan Aquifer. In the area of the proposed well field, the horizontal hydraulic conductivity was based on a two-well aquifer test conducted by INTERA and documented in the “Aquifer Test And Analysis Report for The Ochoa Mine Project” (INTERA 2012) using two of the eight planned production wells, ICP-WS-01 and ICP-WS-02 (see **Figure 2-4**). These wells were about 1,500 feet apart and gave an average estimated horizontal hydraulic conductivity for the Capitan Aquifer of 7 feet/day. Hydraulic conductivity in the zone near the Pecos River was based on data from Barroll et al. (2004) and in the zone of constriction near the Eddy/Lea county line associated with the Laguna submarine canyon the horizontal conductivity was based on drill stem tests report by Harris and Saller (1999) for a petroleum well. All other hydraulic conductivity values were adjusted during model calibration.

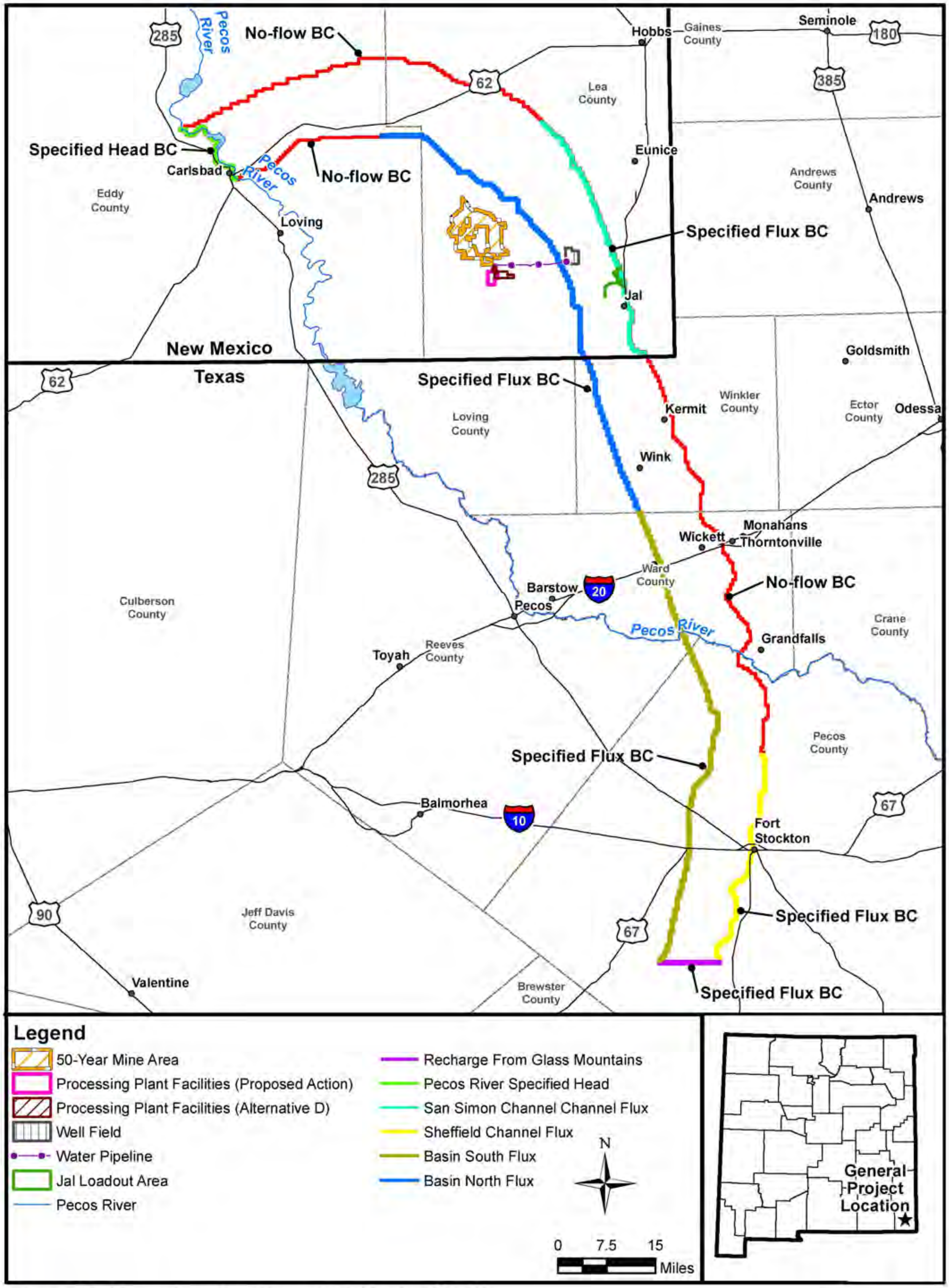


Figure 4.3-4 Boundary Conditions in Calibrated Model

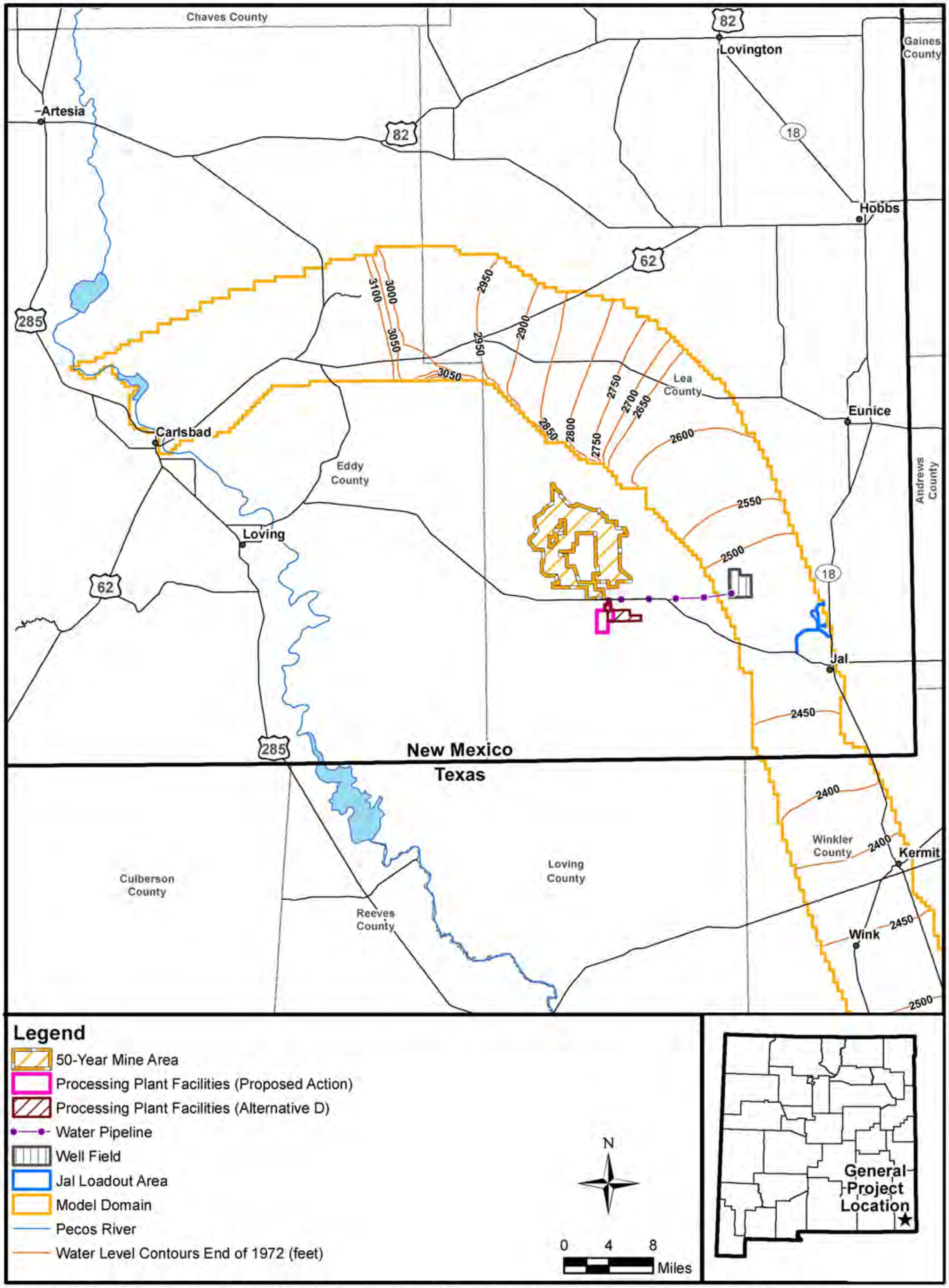


Figure 4.3-5 Capitan Reef Aquifer Water Levels After Intensive Texas Oil and Gas Development

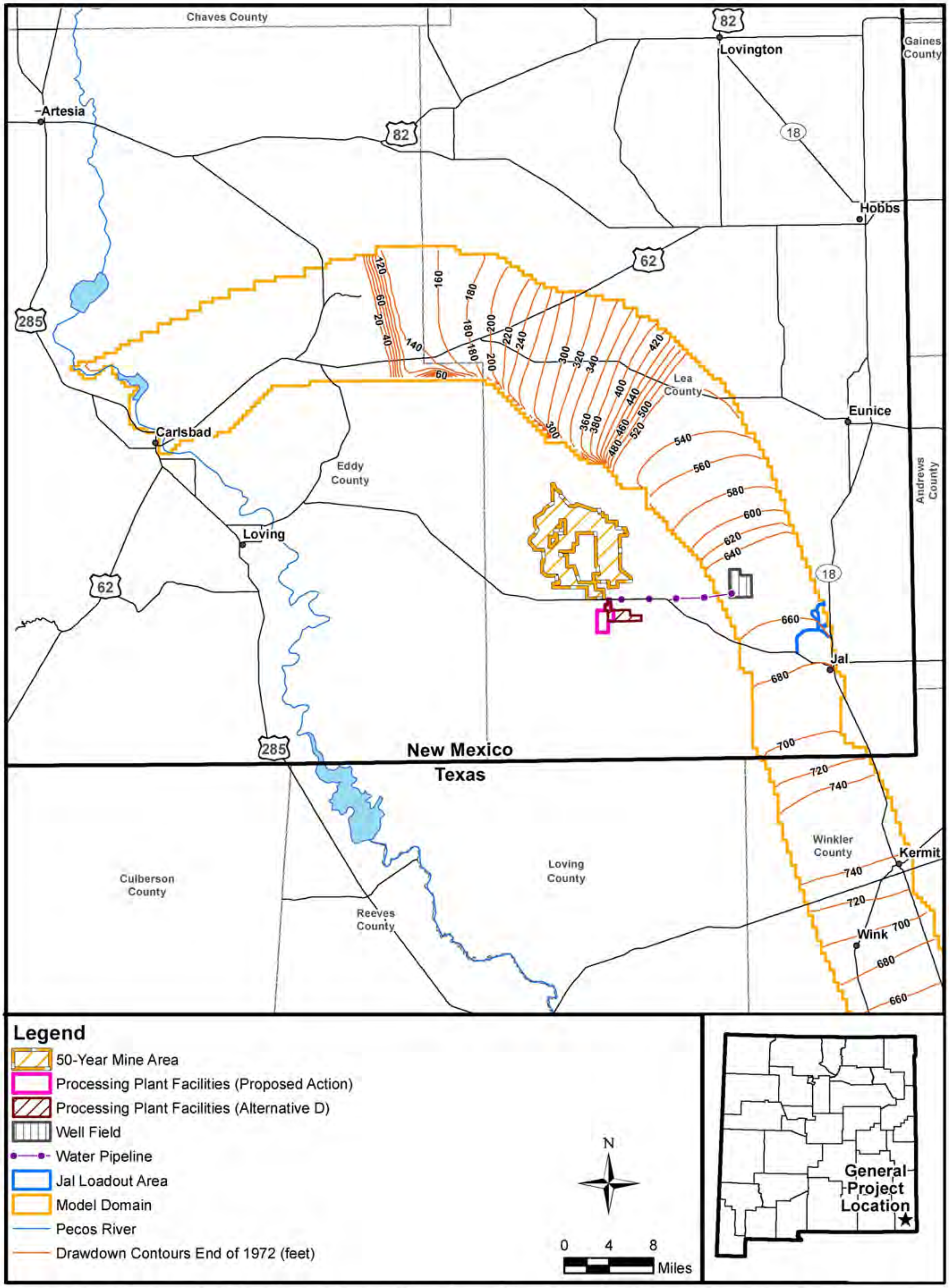


Figure 4.3-6 Capitan Reef Aquifer Maximum Drawdown After Intensive Texas Oil and Gas Development

The model as calibrated suggests that the area at the zone of constriction (Laguna submarine canyon) and the immediately to the southeast have very low hydraulic conductivity values. The area of the proposed well field has the highest hydraulic conductivity, which is consistent with this being an area where water can be extracted from the aquifer, as evidenced by data from the inactive Jal well field west of Jal, New Mexico.

The area of the west Texas oil fields has a moderately high conductivity consistent with the interaction between the Capitan Aquifer and the well fields discussed by Hiss (1975). The area from the Pecos River to the constriction in the Capitan Aquifer near the Eddy/Lea county line (Zone 1) also has a moderate hydraulic conductivity.

Calibration Model Sensitivity Analyses

The calibration in the calibrated model was evaluated for sensitivity to: 1) the number of pumping wells, 2) hydraulic conductivity, 3) recharge, and 4) specific storage (INTERA 2013).

Overall, hydraulic conductivity in the zones west and east of the Laguna submarine canyon (north of WIPP and near the Eddy/Lea county line) and along the zone separating the Capitan Aquifer from the Delaware Basin show the most sensitivity. Therefore, the calibration of the model is constrained by these boundary conditions.

Predictive Groundwater Model Design

For the model to predict impacts from proposed pumping, INTERA (2013) modified the calibrated Capitan Aquifer model by linking the model to the Carlsbad Groundwater (CAGW) Superposition Model of Barroll et al. (2004) for the area from the Eddy/Lea county line to the Pecos River (Hydraulic Conductivity Zone 1 shown on **Figure 4.3-3**). The flux in the Predictive Model was applied to the eastern boundary of the Model and the CAGW Model was run to quantify any change in groundwater base flow to the Pecos River under the Proposed Action.

4.3.2.3 Assumptions

Impacts to deep groundwater were determined based on the location and amount of groundwater drawdown in the Capitan Aquifer. Impacts to shallow aquifers was more qualitative in nature.

The following assumptions were used in the analysis of impacts to water resources:

- Complex groundwater systems can be adequately portrayed through the Capitan Aquifer groundwater model.
- Ponds, structures, and the tailings stockpile would be designed to minimize adverse impacts to groundwater and would comply with federal and state requirements that protect potable water.
- All monitoring and environmental protection measures described in Section 2.4.7 would be implemented.
- Drawdown in excess of 700 feet may result in saline water in the lower part of the Captain Aquifer moving up through the profile in the area of the proposed well field.

The design of groundwater models is based on a conceptual understanding or representation of the geologic and hydrologic components found in a natural aquifer system. For the section of the Capitan Aquifer extending from the Pecos River near Carlsbad, New Mexico, to the Glass Mountains in west Texas, the following assumptions were used in the conceptual groundwater model prepared for the Ochoa Mine Project (INTERA 2013):

- The Capitan Aquifer, as defined by Hiss (1975), is considered to be a single aquifer system that includes the Capitan Limestone, the Goat Seep Formation, and the backreef carbonate facies (formations) of the Artesia Group, referred to by Hiss (1975) as the “Carlsbad Facies.”
- The evaporites in the Artesia Group backreef sedimentary formations, found inland from the lagoonal carbonate facies (Hiss 1975), act to substantially reduce the permeability of the Artesia Group backreef aquifers. The reduction in permeability limits the hydrological interaction between the Artesia Group back-reef aquifers and the Capitan Aquifer. This assumption is supported by information obtained from studies of oil and gas drilling and drill-stem permeability testing (Hiss 1975; INTERA 2013).
- Two paleochannels, the San Simon and Sheffield channels provide the only hydrologic connection between the Artesia Group backreef aquifers, the San Andres Formation, and the Capitan Aquifer. These channels were operative during the formation of the Capitan Reef Complex (Hiss 1975). As the Delaware Basin subsided and the Capitan Reef Complex developed both vertically and laterally, deposits of clastic sediments filled the channels, with the Sheffield Channel filling early in the history of the Capitan Reef Complex and the San Simon Channel filling much later in the Permian (Hiss 1975; Scholle 2012)
- Currently, limited hydrologic connection occurs between the sediments of the Delaware Basin and the Capitan Aquifer due to the low permeability of the Delaware Basin sedimentary formations (Hiss 1975; INTERA 2013).
- An indirect hydrologic interaction occurs between the Pecos River and the Capitan Aquifer on the east side of the Pecos River near Carlsbad, New Mexico. This interaction involves groundwater base flow from the aquifer to the river or seepage from the river to the aquifer when the river stage is above the groundwater potentiometric surface.
- The only recharge to the Capitan Aquifer east of the Pecos River involves infiltration of precipitation in the Glass Mountains located at the southernmost extent of the Capitan Reef Complex in west Texas (**Figure 4.3-7**). Recharge to the Capitan Aquifer west of the Pecos River in the Guadalupe Mountains does not affect the Capitan Aquifer east of the Pecos River due to the barrier established by the incision of the Pecos River into the Capitan Reef Complex as described in Barroll et al. (2004) and Hiss (1975).

Near the Eddy/Lea county line, the Capitan Aquifer has an area of low permeability attributed to the Laguna Submarine Canyon and a north-south trending dike complex that occurred during deformation events following the formation of the Capitan Limestone. This low permeability and associated lack of impact to wells west of this zone is supported by data related to extensive petroleum pumping in west Texas during the 1970s (Barroll et al. 2004), limited petroleum drill stem test data (Harris and Saller, 1999), and water level data from Hiss (1975). Impacts to groundwater would be significant if the Proposed Action or alternatives result in one or more of the following:

- Modeled groundwater drawdown precludes supplying the project with the required water supply.
- Damage to potable water from project components is identified.
- Modeled groundwater drawdown decreases flow contributions to the Pecos River by more than 1 percent annually, compared to current average annual flow contributions (not to total flow in the Pecos River).

4.3.2.4 No Action Alternative

Under the No Action Alternative, ICP would not develop its proposed well field in Lea County. Groundwater withdrawal in the Capitan Aquifer would continue in the west Texas oil fields in Pecos and Winkler counties.

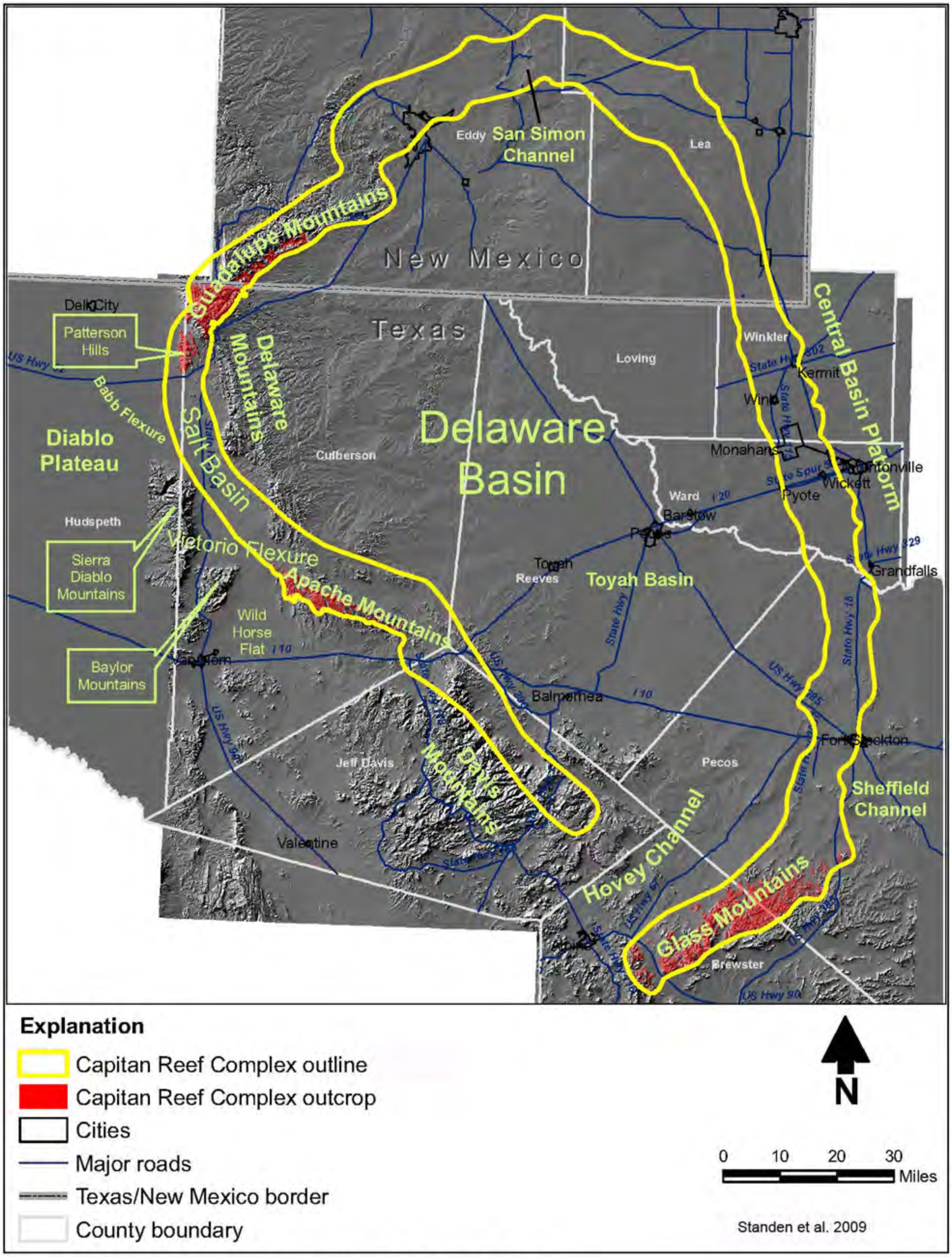


Figure 4.3-7 Structural Features Related to Capitan Reef

Under the No Action (steady state) model, groundwater in the Capitan Aquifer flowed from the Glass Mountains (water level 3,210 feet amsl) northward to the Pecos River (water level 3,140 amsl). Recharge of 1,780 afy from the Glass Mountains was balanced by outflow through the San Simon Channel of 248 afy and outflow of 1,535 afy through the Sheffield Channel. No water was exchanged with the Delaware Basin and influx from the Pecos River was 0.45 afy (INTERA 2013). This amount of groundwater withdrawal would be comparable to the amount consumed during the period from the late 1960s to 1975 as predicted in the Calibrated Model. The existing water levels in the Capitan Reef Aquifer displayed in **Figure 4.3-8** would not change under the No Action Alternative.

4.3.2.5 Alternative A—Proposed Action

The Ochoa Mine Project proposes to pump approximately 4,000 gpm of groundwater from the Capitan Aquifer using up to 8 wells located in the well field shown in **Figure 2-4**. The wells would be screened in the Capitan Limestone portion of the Capitan Aquifer, which extends over most of the saturated thickness of the Capitan Aquifer, shown in **Figure 4.3-2**.

Based on the predictive model, drawdown at the Eddy/Lea county line would be approximately 225 feet below the current aquifer level. Maximum drawdown in the well field would be approximately 650 feet and maximum drawdown in the west Texas oil field area would be approximately 600 feet after 50 years of pumping. Drawdown in the Capitan Aquifer in Eddy County would be five feet or less, while maximum drawdown in the remainder of Lea County would range between 200 to 600 feet. Modeled drawdown at the Pecos River after 50 years of pumping of the ICP wells is predicted to be approximately 0.1 foot**. Figure 4.3-9** shows the maximum drawdown in the Capitan Aquifer after 50 years of pumping. Groundwater would flow to the ICP well field from all directions in the aquifer. **Figure 4.3-10** displays the water levels after 50 years of pumping.

To estimate the impact of project pumping over 50 years on the Pecos River, INTERA (2013) estimated the flux across the Eddy/Lea county line using the Predictive Model, then applied this flux to the CAGW model. This change in base flow, referred to as “leakage” from the Pecos River by INTERA (2013) was estimated at 28.4 afy. The predicted leakage would be approximately 0.07 percent of the estimated average flow of 41,580 afy in the Pecos River, as measured from 1965 to 2001 (INTERA 2013). For comparison, the flux from the Pecos River during the period of oil and gas pumping in west Texas from the late 1960s to around 1972 used in the Calibrated Model was greater at 33.2 afy. The amount of water contained in the backreef is approximately 1.3 billion acre-feet, of which about 895 million acre-feet is in the San Andres Formation. Pumping by the ICP wells over 50 years would consume about 82,600 acre-feet of water from the San Andres Formation and about 5,345 acre-feet from the Artesia Group in the backreef. The amount of the stored water in the backreef consumed by ICP well pumping over 50 years would be approximately 0.003 percent, resulting in minimal impact to the total amount of available water.

Rebound to 90 percent of pre-pumping levels in the Capitan Aquifer after cessation of project-related pumping was estimated to take approximately 500 years based recharge from the Glass Mountains.

Because the Capitan Aquifer is a confined aquifer located over 3,000 feet below the ground surface in the area of the proposed well field, no surface resources such as soils or vegetation would be affected by groundwater drawdown. No impacts to water quality in the Capitan Aquifer were modeled, but the drawdown in excess of 700 feet at the end of 50 years may result in upward movement of the saline water in the lower part of the Captain Aquifer around the proposed well field. Should this happen, it would result in a temporary localized increase in the salinity of the Capitan Aquifer. Once the aquifer rebounds after cessation of the pumping, the water quality would return to pre-pumping water quality.

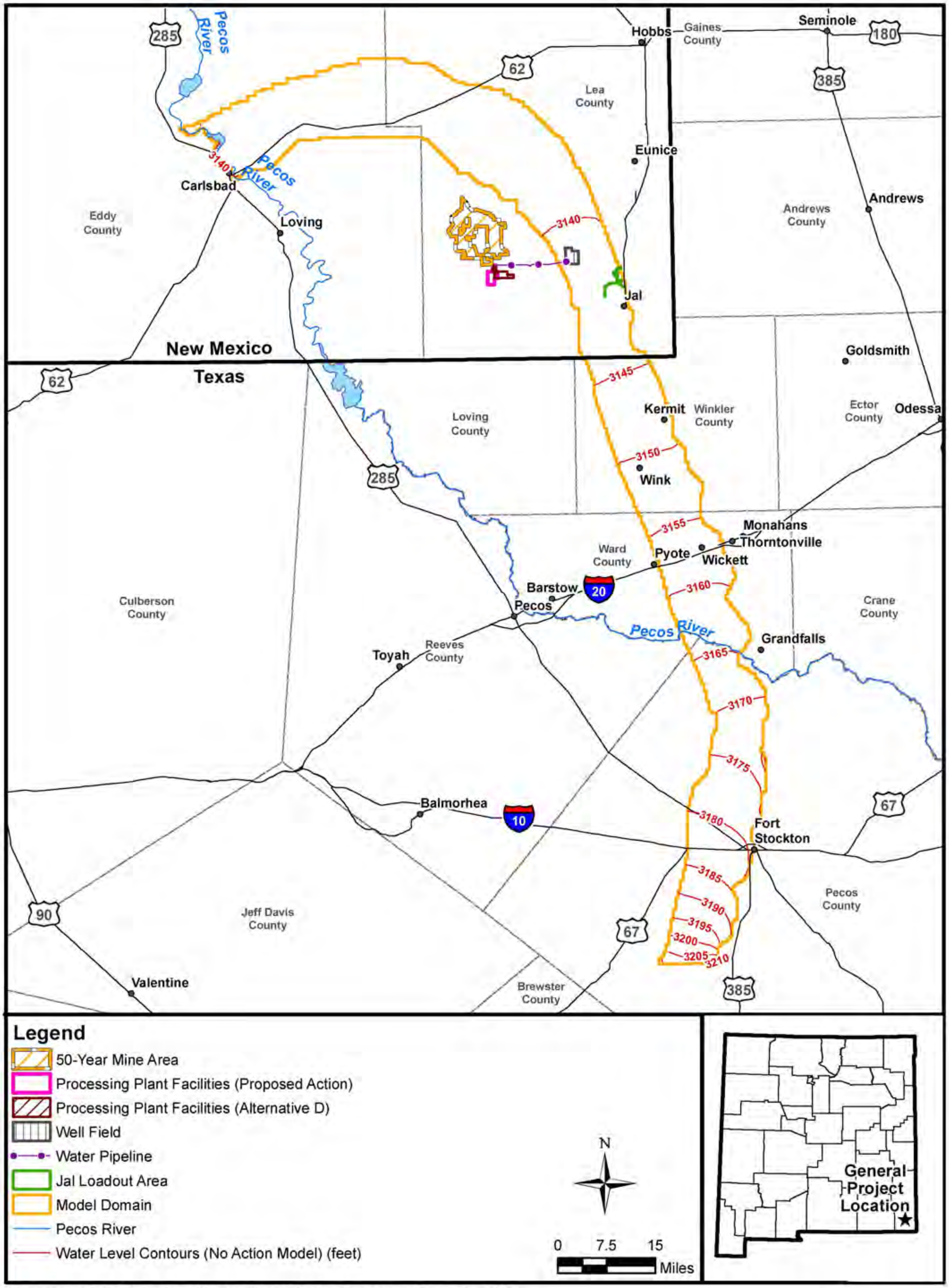


Figure 4.3-8 Existing Water Levels in Capitan Reef Aquifer

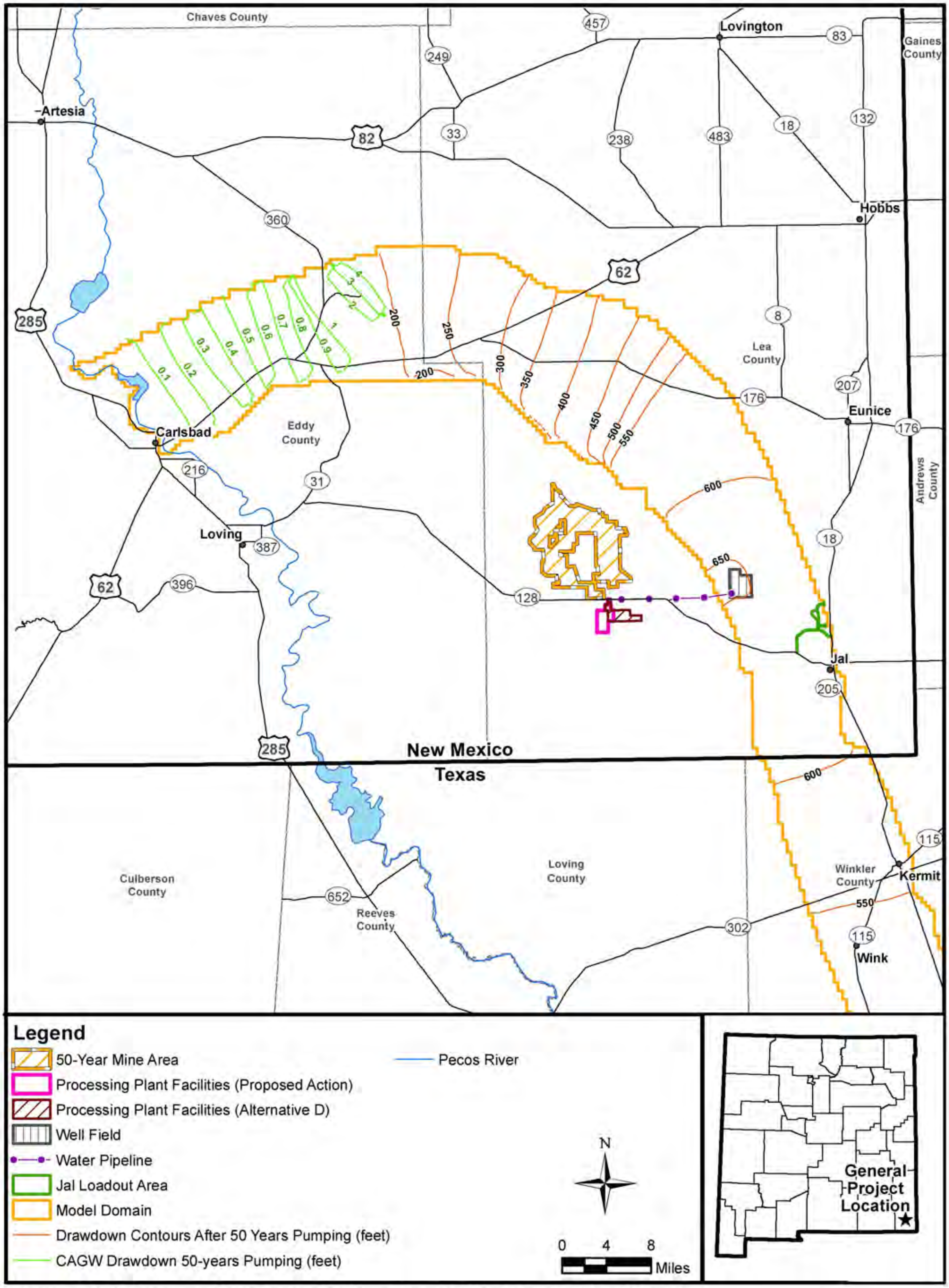


Figure 4.3-9 Maximum Drawdown Contours Under Proposed Action Alternative

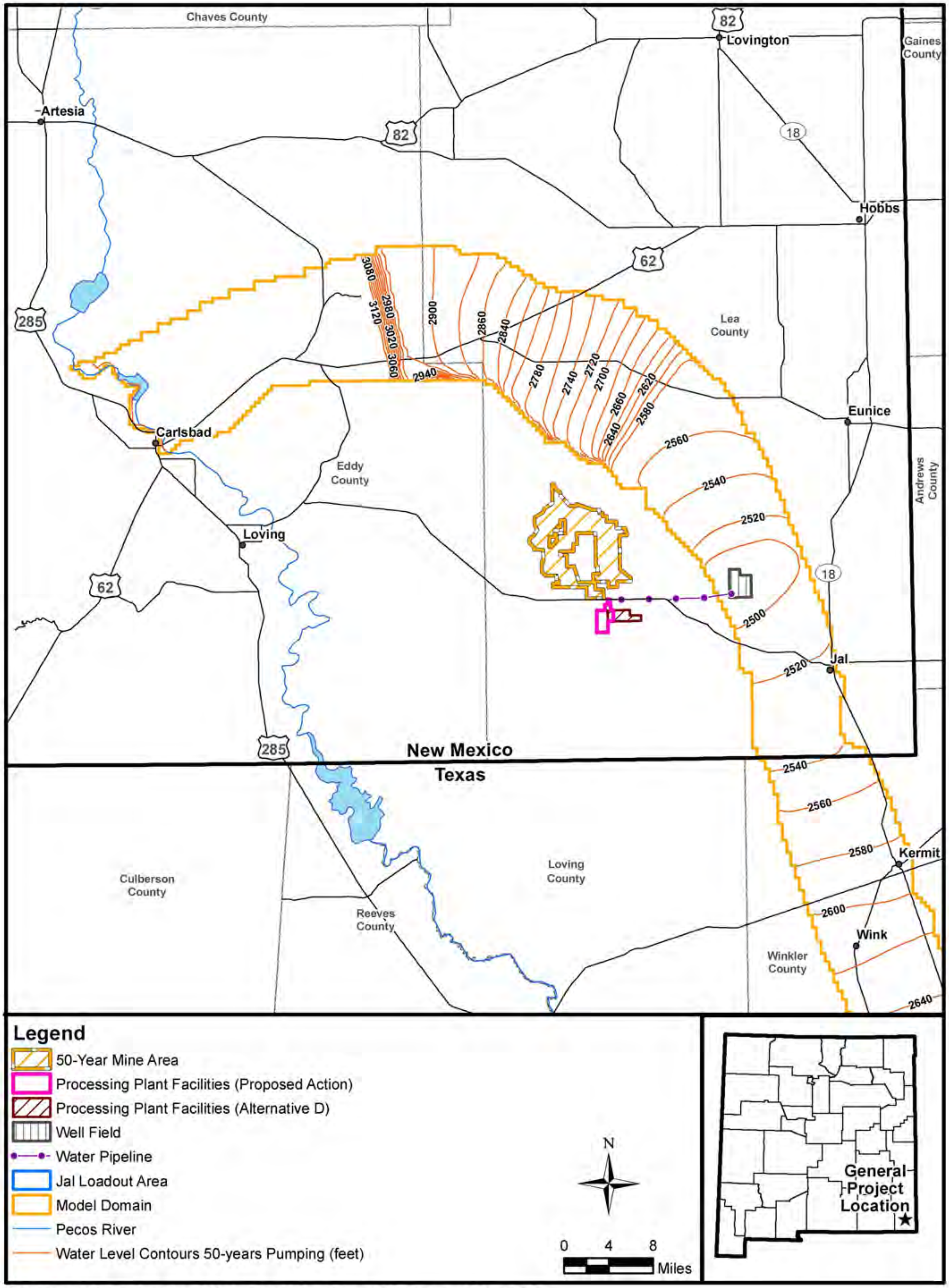


Figure 4.3-10 Capitan Water Levels After 50 Years of Pumping

The ponds at the Processing Plant Site would require regular maintenance and monitoring after construction. Pond liners may need to be replaced if leaks are detected. The installation, maintenance, and regular observation of the water quality in the proposed monitoring well system near the ponds would detect leaks into the shallow aquifer before water quality is affected in domestic or livestock wells offsite. The monitoring wells would be installed prior pond construction to determine groundwater flow and water quality. Baseline water quality data should be collected from nearby wells before construction begins.

4.3.2.6 Alternative B

Impacts to groundwater under this alternative would be the same as that described for the Proposed Action.

4.3.2.7 Alternative C

Impacts to groundwater under this alternative would be the same as that described for the Proposed Action.

4.3.2.8 Alternative D

Impacts to groundwater under this alternative would be the same as that described for the Proposed Action.

4.3.2.9 Preferred Alternative

Impacts to groundwater under this alternative would be the same as that described for the Proposed Action.

4.3.3 Mitigation Measures

The following measures are recommended to add further protection for surface water resources.

- Water sprayed for dust suppression, including blending with tackifiers, should be obtained from fresh water sources or treated water sources to minimize the potential for increased salinity levels that may flow into drainages and waterbodies. The BLM must review and approve the chemicals and water source to be used for road dust suppression.
- An annual inspection of the locations where the water pipeline crosses drainages would be carried out by the proponent and reported to the appropriate regulatory agency (state or federal depending on land status).
- The water pipeline should be constructed with automatic shutoffs to minimize adverse effects from leaks.
- Under Alternative D, additional offsite mitigation of existing beneficial uses to minimize adverse impacts to habitat, lands, surface water drainages, and groundwater recharge areas should be coordinated with BLM and state agency staff.

The following measures are recommended to add further protection for groundwater resources.

- Monitoring of the drawdown in the Capitan Aquifer would be done by ICP and possibly by the BLM using available wells that are accessible for routine monitoring of the Capitan Aquifer. The existing monitoring wells near the Pecos River should be utilized by ICP to get a more accurate evaluation of drawdown that may affect the river.
- To ensure accurate shallow groundwater quality information and minimize the potential for adverse impacts to the shallow aquifer, the monitoring wells to be established in the vicinity of the processing plant site and near the subsidence area of the mine should be located upgradient and downgradient of groundwater flow direction. At least three wells should be

located upgradient and three wells downgradient of the evaporation ponds and the dry stack tailings stockpile for a total of at least six wells in the processing plant site.

- Should the discharge reduction at the Pecos River caused by project-related Capitan Aquifer pumping be unacceptable to the New Mexico State Engineer, mitigation may be required. Mitigation measures may include a reduction in pumping by ICP, or the acquisition of water rights that could be used by ICP to augment river flows when necessary.

4.3.4 Summary of Impacts

Under all action alternatives, the impacts to surface water resources from the proposed project would be avoided or reduced to less than significant levels by project design and operational controls, by implementing BMPs, and by complying with agency conditions and regulatory provisions.

Although the streams in the project area are typically dry, if brackish water were used for dust suppression on roads, additional salts could accumulate in drainages during runoff, eventually adversely affecting surface water quality. Similar water quality impacts could result from a pipeline rupture at eroding stream crossings. Recommended mitigation measures would minimize increased surface salinity that could affect free water or moisture at or near the surface.

Under all action alternatives, groundwater pumping would utilize an estimated 387,425 acre-feet of water for operations over the 50-year life of the mine. This would result in a maximum drawdown in the Ochoa well field of approximately 650 feet and maximum drawdown in the west Texas oil field area of approximately 600 feet. Drawdown in the Capitan Aquifer in Eddy County would be 5 feet or less, while the maximum drawdown in the remainder of Lea County would be approximately 600 feet. Backreef groundwater would supply approximately 0.003 percent of its available storage. Modeled drawdown at the Pecos River after 50 years of pumping the ICP wells is predicted to be approximately 0.1 foot. No effect on shallow aquifers would result as long as processing facilities are monitored and maintained.

4.3.5 Cumulative Impacts

The cumulative effects study area for surface water includes the 13 subwatersheds that contain a portion of the project area, and within which general project components are located. This includes an area within the southern half of Lea County from approximately the county line to the west to Jal to the east (see **Figure 3.3-1**). Any surface disturbing activities, especially those that modify surface water flows or add sediment to surface water runoff, would affect the few streams in the region. These impacts would come from oil and gas development construction of pads, pipelines, and power lines, and from construction that is likely to occur to add new industrial sites and housing in the region. As long as erosion and sediment control plans and SWPPPs are implemented successfully, adverse effects on surface water in the region should be minimal.

The cumulative effects study area for groundwater encompasses the Capitan Reef Aquifer and the backreef that contributes to the project's water supply. Over the 50-year proposed life of the Ochoa Mine, additional demands for water from the Capitan Aquifer may be expected to supply oil and gas development both in the west Texas oil fields and in Lea County. Because most, if not all, other water users (drinking water, agriculture, municipal, and industrial uses) obtain water from shallower aquifers that are not connected to the Capitan Aquifer, other water uses would not contribute to the cumulative impacts of the deep groundwater in the region. These other uses are carefully managed by the New Mexico State Engineer to avoid or minimize adverse effects on Pecos River flows.

Additional consumption of water from the Capitan Aquifer would increase the drawdown in the aquifer and may increase the leakage from the Pecos River, thereby reducing flow in the river, depending on the location of the pumping. If the demand for water from the Capitan Aquifer increases and well permits are approved, then the drawdown in the aquifer and the leakage from the Pecos River can be expected to increase accordingly.

4.4 Soil Resources

The following impact analysis focuses on soil resources that may be affected by construction and operation of the proposed project.

4.4.1 Issues

Issues related to soil resources include the following:

- Erosion of disturbed soils can damage long-term soil productivity.
- Successful reclamation of disturbed soils is important to maintain productivity and stability.
- Concern for possible soil contamination associated with spills of salt brine thereby affecting reclamation potential.

4.4.2 Method of Analysis

Potential impacts to soils and the potential for soils to affect project construction and maintenance were investigated by examining the soil types, their extent, and their physical and chemical characteristics in relation to the locations of proposed surface disturbance under each alternative. Using geographic information system (GIS), the Soil Survey Geographic spatial data (NRCS 2008) was overlaid with the locations of proposed ROWs and project-related facilities to identify the soil map units that would be disturbed. The tabular soil database was used to identify the acreage and locations of these soils and to summarize the limitations of the soil map units relevant to the proposed project.

- The acreage of soils with severe hazards and limitations was calculated to quantify the amount of aggressive environmental protection measures and monitoring.
- The soil characteristics and acreage of soils initially disturbed by construction were identified because these areas would be likely to have accelerated erosion in the short-term, until interim reclamation is implemented.
- The soil characteristics and acreage of soils to be left bare or in an altered state for the life of the project (such as roads and soils underlying structures) were identified to help identify construction and stabilization problems.

4.4.3 Assumptions

Analysis was based on the following assumptions:

- Bare soil (without vegetation or other surface cover) with a surface layer that has been altered from its natural condition is more susceptible to accelerated wind and water erosion than undisturbed soil.
- Any surface disturbance has the potential to degrade soil quality and productivity because it damages the biological soil crust and exposes the bare soil to the erosive forces of wind and water until revegetation or other ground cover is established.
- Erosion from disturbed areas would be minimal once vegetation is reestablished. Successful establishment of vegetation generally takes a minimum of 3 to 5 years, depending on soil and precipitation, and requires monitoring during this time.
- The New Mexico Standards for Public Land Health (BLM 2001) provide minimum standards for vegetation health, vigor, soil cover, and erosion rates that apply to all BLM administered activities.
- Surface disturbance from construction would modify soils by disrupting soil stability, changing vegetative cover that can reduce nutrient recycling, damaging biological crusts, decreasing productivity, and increasing compaction.

- When surface disturbance occurs on highly erodible soils, the potential for accelerated erosion is greater than on less erodible soils. Sensitive soils would incur greater adverse impacts from surface-disturbing activities than nonsensitive soils. Sensitive soils include those that are highly erodible, have a high pH, high salinity or sodicity, have a high clay content, or have a low reclamation potential.
- The risk of the failure of erosion control measures is greater on highly erodible soils. To be effective on highly erodible soils, more extensive BMPs and more aggressive maintenance techniques than those commonly used are often required.
- Erosion on the landscape may contribute to sediment yield if it results in sediment delivery to the surface water drainage system of arroyos and streams. Only a fraction of the total amount of soil erosion on the landscape actually reaches surface water channels.
- Operating motorized vehicles on moist soils, especially heavy equipment, is likely to cause compaction of the surface layer, which may increase runoff, decrease infiltration and aeration, and reduce soil productivity by making it more difficult for plant roots to establish or obtain soil moisture and nutrients.

The thresholds for impact analysis and significance include:

- The significance of the effects on soils is related to the areal extent of the impacts and the length of time necessary for the soils to recover following surface disturbance; and
- The significance of the direct effects on soils from the surface-disturbing activities (soil displacement, compaction, erosion, loss of productivity) can be assessed in relation to the extent of indirect effects on other resources. For example, if surface-disturbing activities cause erosion that leaves the construction site and enters waterways that already have identified impairment due to high volumes of sediment, turbidity, and excessive stream bottom deposits, a small increase in sediment entering this water system may be considered significant. If removal or compaction of topsoil damages soil-protecting vegetative cover and limits the success of revegetation to stabilize soils, accelerated erosion would result that would reduce feed and cover for wildlife, forage for livestock, and downstream water quality.

4.4.4 No Action Alternative

Under the No Action Alternative, the proposed project would not be authorized by the BLM and would not be developed. Associated impacts to soils from construction and operation would not occur. Natural and anthropogenic effects of erosion that may be caused by common land uses, such as agriculture, activities associated with oil and gas development, recreation, and grazing would continue to affect soil resources at present levels in the project area.

4.4.5 Alternative A—Proposed Action

The Proposed Action would result in approximately 2,397 acres of initial soil disturbance. **Table 4.4-1** provides the acres of disturbance for Alternative A associated with specific limitations as described in Section 3.4. Note that the acreage totals below do not equal the total amount of surface disturbance because some soil map units have more than one limitation and some do not have any or are not rated in the soil survey.

Surface disturbance associated with construction of project roads, processing facilities, wells, ponds, pipelines, railroad loadout facility, power lines, and other associated facilities would alter soils to varying degrees. The most notable disturbance to soils would occur in association with the disturbance occurring on soils with severe limitations, identified as “Poor” in **Table 4.4-1**.

Table 4.4-1 Soil Disturbance Limitations in Project Area Associated with Alternative A

Soil Limitation	Good		Fair		Poor	
	acres	% of area	acres	% of area	acres	% of area
Processing Plant Site						
Wind Erosion	0	0	1,216	42	369	13
Water Erosion	1,586	55	0	0	0	0
Shallow Excavations	0	0	174	6	1,412	49
Potential for Revegetation	0	0	0	0	1,586	55
Topsoil Suitability	8	0	166	6	1,412	49
Mine Shaft and Mine Surface Facilities						
Wind Erosion	0	0	0	0	32	1
Water Erosion	32	1	0	0	0	0
Shallow Excavations	0	0	7	0	25	1
Potential for Revegetation	0	0	0	0	32	1
Topsoil Suitability	1	0	6	0	25	1
Jal Loadout (Includes Access Road)						
Wind Erosion	4	0	98	3	288	10
Water Erosion	388	13	0	0	4	0
Shallow Excavations	0	0	134	5	258	9
Potential for Revegetation	0	0	11	0	381	13
Topsoil Suitability	0	0	136	5	256	9
Water Pipeline						
Wind Erosion	0	0	13	<1	29	<1
Water Erosion	43	<1	0	0	0	0
Shallow Excavations	0	0	22	<1	21	<1
Potential for Revegetation	0	0	2	0	41	<1
Topsoil Suitability	1	<1	21	<1	21	<1
Well Field Area						
Wind Erosion	5	0	709	24	1,832	63
Water Erosion	2,546	88	0	0	0	0
Shallow Excavations	0	0	402	14	2,144	74
Potential for Revegetation	0	0	15	1	2,531	87
Topsoil Suitability	15	1	731	25	1,800	62

Note: Acreage for each column do not equal the total amount of surface disturbance because some soils have more than one limitation (leading to an overestimate) and some do not have any rating in the soil survey (leading to an underestimate).

Grading and leveling would be required to construct the tailings pile, wells, and facilities, with the greatest level of effort required on sloping areas. During construction, the soil profiles would be mixed causing a corresponding loss of soil structure. Some of the subsoils in the area are characterized as having high pH, salinity, and sodicity. Soil mixing would alter physical and chemical properties, which is likely to have negative effect on soil productivity and alter future revegetation potential and reclamation success.

It should be noted that most of the Processing Plant Site has soils that are rated as poor for topsoil suitability. In the soil survey ratings, topsoil is considered to be the top layer or “A” horizon. In ICP’s mine plan (ICP 2011), the “topsoil” would be removed in advance of grading and construction of the ponds, buildings, and tailings stockpile at the Plant Site, and stored for use in site reclamation at the end of the project. The soil to be stripped and stored as proposed by ICP, however, includes a mixture of the true topsoil (A horizon) and subsoil, which creates a less suitable environment for revegetation. Because most of the true topsoil is rated as poor, meaning that it has poor productivity, and most of the Plant Site has poor potential for revegetation, it is likely that suitable topsoil would have to be transported to the site to supplement the onsite soil stockpiles to ensure successful reclamation. Soils under the tailings stockpile would not be available for future uses because the tailings stockpile would be permanent. There would be no difference in the impacts to soils for the two power supply options. In both options, offsite and onsite power supply, the same area would be disturbed during construction and would most likely be used for equipment storage and traffic during operations if it is not covered by the cogeneration facilities.

The potential for erosion would increase through the loss of vegetation and biological crust cover as compared to an undisturbed state. Biological soil crusts are considered an important component in arid ecosystems. They provide soil stability, prevent erosion, fix nitrogen, increase infiltration rates, and may reduce noxious weed migration. In arid environments, biological soil crusts are essential for soil stability due to minimal vegetative growth and soil cover. Biological soil crusts are highly susceptible to disturbance, especially in sandy soils (Belnap and Gardner 1993). Recovery rates are generally slow, specifically for lichen and moss, which can take 45 to 250 years, respectively (Belnap and Gillette 1997). Biological crusts would be damaged by vehicle traffic, clearing, grubbing, and excavation. The effect of the proposed construction and operations activities on biological soil crusts would be very long-term.

Most of the soils in the project area where excavation is proposed, such as along the water pipeline ROW, the well field, and the Plant Site, have severe limitations associated with shallow excavations. Where these soil types are located, trenches must be stabilized if allowed to stand open or if workers must enter a trench.

Construction of roads, ponds, and pipelines would result in a removal of vegetation, interrupting nutrient cycling and altering soil productivity. Indirect effects related to the construction of new access roads may include increased water erosion caused by concentrated surface water runoff that would be intercepted by road berms and ditches. Road surface stabilization with caliche would minimize erosion on road surfaces but would increase runoff due to decreased infiltration. Road maintenance and the construction of roads according to BLM requirements would minimize soil erosion.

Vehicle traffic on roads and in areas where surface facilities are proposed during construction and operations would result in soil compaction, especially under wet conditions. These impacts would begin immediately as the soils are subjected to grading and other construction activities and would move to a steady state as construction activities are completed and interim reclamation and operations begin. As disturbed areas are reclaimed and vegetation is re-established, the potential for erosion and sedimentation would be reduced.

4.4.6 Alternative B

Alternative B would result in similar impacts to soils due to surface disturbance compared to the Proposed Action. If the tailings stockpile were expanded to reduce the total height without reducing the total volume of tailings, the acreage of permanent alterations to soils would increase in and possibly adjacent to the proposed Processing Plant Site. If the volume of tailings were decreased, the total footprint of the stockpile and the soils permanently altered may be slightly decreased.

4.4.7 Alternative C

Alternative C would result in the same impacts to soils as described for the Proposed Action, Alternative A.

4.4.8 Alternative D

Alternative D would result in 2,389 acres of surface disturbance to soils resources. Impacts would be similar to those described for the Proposed Action. **Table 4.4-2** provides the acres of disturbance for Alternative D associated with specific limitations described in Section 3.4.

Table 4.4-2 Soil Disturbance Limitations Associated with Alternative D

Soil Limitation	Good		Fair		Poor		Not Rated	
	acres	%	acres	%	acres	%	acres	%
Plant Facilities								
Wind Erosion	0	0	1,356	<1	222	<1	0	0
Water Erosion	1,577	<1	0	0	0	0	0	0
Shallow Excavations	0	<1	125	<1	1,453	<1	0	<1
Potential for Revegetation	0	<1	0	<1	1,577	<1	0	<1
Topsoil Suitability	20	<1	90	<1	1,468	<1	0	<1
Mine Shaft and Mine Surface Facilities								
Wind Erosion	0	0	0	0	32	<1	0	0
Water Erosion	32	<1	0	0	0	0	0	0
Shallow Excavations	0	<1	7	<1	25	<1	0	<1
Potential for Revegetation	0	<1	0	<1	32	<1	0	<1
Topsoil Suitability	1	<1	6	<1	25	<1	0	<1
Jal Loadout (Includes Access Road)								
Wind Erosion	4	<1	98	<1	288	<1	0	0
Water Erosion	388	<1	0	0	4	<1	0	0
Shallow Excavations	0	<1	134	<1	258	<1	0	<1
Potential for Revegetation	0	<1	11	<1	381	<1	0	<1
Topsoil Suitability	0	<1	136	<1	256	<1	0	<1
Water Pipeline								
Wind Erosion	0	0	13	<1	29	<1	0	0
Water Erosion	43	<1	0	0	0	0	0	0
Shallow Excavations	0	0	22	<1	21	<1	0	0
Potential for Revegetation	0	0	2	<1	41	<1	0	0
Topsoil Suitability	1	<1	21	<1	21	<1	0	<1

Table 4.4-2 Soil Disturbance Limitations Associated with Alternative D

Soil Limitation	Good		Fair		Poor		Not Rated	
	acres	%	acres	%	acres	%	acres	%
Well Field Area								
Wind Erosion	5	<1	709	<1	1,832	<1	0	0
Water Erosion	2,546	<1	0	0	0	0	0	0
Shallow Excavations	0	<1	402	<1	2,144	<1	0	<1
Potential for Revegetation	0	<1	15	<1	2,531	<1	0	<1
Topsoil Suitability	15	<1	731	<1	1,800	<1	0	<1

Note: Acreage for each column do not equal the total amount of surface disturbance because some soils have more than one limitation (leading to an overestimate) and some do not have any rating in the soil survey (leading to an underestimate).

Surface disturbance associated with construction of project roads, processing facilities, wells, ponds, pipelines, railroad loadout facility, power lines, and other associated facilities would alter soils to varying degrees. The most notable disturbance to soils would occur in association with the disturbance occurring on soils with severe limitations, identified as “Poor” in **Table 4.4-2**. Under Alternative D, there is potential to alter a playa, which typically contains soils high in expansive clays that are calcareous and erodible.

4.4.9 Preferred Alternative

The Preferred Alternative would result in similar impacts to soils due to surface disturbance compared to the Proposed Action. If the volume of tailings were decreased, the total footprint of the stockpile and the soils permanently altered may be slightly decreased, as described under Alternative B.

4.4.10 Mitigation Measures

The following measures are recommended to be implemented to improve reclamation at the end of the project.

- During reclamation, compacted areas (typically any area that received repeated vehicle traffic) should be subsoiled or ripped to the depth of compaction. This will help prepare the seedbed, encourage surface water infiltration, and help to minimize accelerated runoff and erosion.
- ICP will develop seed mixtures in consultation with the BLM for soils with low reclamation potential that include species that are tolerant to saline, sodic, or strongly alkaline soils.

4.4.11 Summary of Impacts

Implementation of the Proposed Action would result in impacts associated with the long-term loss of soil productivity on approximately 1,663 acres associated with roads and other aboveground structures. As facilities are decommissioned and portions of the project area are reclaimed these impacts would be reduced. The soil covered by the dry stack tailings stockpile would be taken permanently out of use as productive soils. The areal extent of the tailings stockpile would vary under Alternative B and may be slightly less under the Preferred Alternative. Implementation of Alternative D would result in approximately the same acreage of impacts associated with the long-term loss of soil productivity; however the soil characteristics would be slightly different than under the Proposed Action, primarily due to the surface disturbance of playa soils.

4.4.12 Cumulative Impacts

The cumulative effects study area for soils includes essentially the same area surrounding the project area as described for surface water in Section 4.3.6. The primary reasonably foreseeable future activities that would be expected to produce incremental and cumulative impacts are oil and gas exploration and development and other surface disturbing activities for construction. Impacts associated with oil and gas development and other construction include removal of vegetation, exposure of the soil, mixing of soil horizons, soil compaction, and loss of topsoil productivity. These impacts could increase runoff and lead to increased susceptibility of the soil to erosion and sedimentation.

Other projects likely to contribute to cumulative impacts to soils in the project area result from surface disturbance related to industrial and residential construction, grazing, vegetation management, recreation, and associated roads. These projects would contribute incremental increases to the current level of effects to soil resources in the study area, similar to those from historic and ongoing management activities.

With implementation of standard and additional mitigation measures, the proposed project, when added to past, present, and reasonably foreseeable future actions is not expected to result in significant cumulative impacts to soil resources.

4.5 Air Quality

4.5.1 Issues

The primary issues related to air quality include potential air quality impacts associated with project-generated air emissions. The air emissions of concern that are evaluated in the following sections are the directly emitted criteria pollutants, the HAP formaldehyde, volatile organic compounds (VOC), and the GHGs, which are CO_2, CH_4, and nitrous oxide (N_2O). The criteria pollutants are evaluated primarily because of their direct impacts on human health when present at concentrations of concern in ambient air but also, for a subset, because of their impacts on AQRVs. HAPs are evaluated because of their impacts on human health. VOC is evaluated because of its contribution to the atmospheric formation of the criteria pollutant O_3.

Air emission sources are typically categorized as stationary, fugitive, or mobile. The construction and operations phases of the project are typically evaluated separately. The distinctions reflect both the physical attributes associated with the source as well as what regulatory programs are applicable.

Stationary sources are those that have a stack, baghouse, or other single emissions point. Emissions from stationary sources can be from fuel combustion, process emissions or a mixture of both. Fugitive emissions sources are those sources that could not reasonably pass through a stack, chimney, or vent and include paved and unpaved roads, open conveyors, or other similar activities that do not have a single point of emission. Mobile sources are typically combustion sources that do not have a fixed location such as vehicles and heavy construction equipment.

An important category of fugitive sources are those associated with fugitive dust emissions. Atmospheric dust arises from the mechanical disturbance of granular material exposed to the air. Dust generated from these open sources is termed “fugitive” because it is not discharged to the atmosphere in a confined flow stream. Common sources of fugitive dust include paved and unpaved roads, agricultural tilling operations, aggregate storage piles, and heavy construction operations (USEPA 1995).

Fugitive dust is caused by two basic physical phenomena:

1. Pulverization and abrasion of surface materials by application of mechanical force through implements (wheels, blades, etc.); and

2. Entrainment of dust particles by the action of turbulent air currents, such as wind erosion of an exposed surface by wind speeds over 19 km per hour (12 miles per hour).

Particulate emissions occur whenever vehicles travel over a paved surface such as a road or parking lot. Particulate emissions from paved roads are due to direct emissions from vehicles in the form of exhaust, brake wear and tire wear emissions and re-suspension of loose material on the road surface. In general terms, re-suspended particulate emissions from paved roads originate from, and result in the depletion of, the loose material present on the surface (i.e., the surface loading). In turn, that surface loading is continuously replenished by other sources. At industrial sites, surface loading is replenished by spillage of material and trackout from unpaved roads and staging areas (USEPA 1995).

When a vehicle travels an unpaved road, the force of the wheels on the road surface causes pulverization of surface material. Particles are lifted and dropped from the rolling wheels, and the road surface is exposed to strong air currents in turbulent shear with the surface. The turbulent wake behind the vehicle continues to act on the road surface after the vehicle has passed. Other variables are important in addition to the silt content of the road surface material. For example, at industrial sites, where haul trucks and other heavy equipment are common, emissions are highly correlated with vehicle weight. On the other hand, there is far less variability in the weights of cars and pickup trucks that commonly travel publicly accessible unpaved roads throughout the U.S. For those roads, the moisture content of the road surface material may be more dominant in determining differences in emission levels between, for example a hot, desert environment and a cool, moist location (USEPA 1995).

Other important industrial sources of fugitive dust include entrainment from disturbed surfaces and material processing and handling operations that result in the release of particulate emissions.

4.5.2 Method of Analysis

The proposed action meets the criteria of a major PSD sources and so the PSD air quality analysis process provides an appropriate methodology for assessing the impacts of this project. PSD rules are designed to keep an area with “good” air in compliance with the AAQS. At a high level this process consists of calculating the potential to emit (PTE) emissions for the facility, modeling those emissions to determine which, if any, pollutants have significant impacts on ambient air quality, and assessing for those pollutants that have significant impacts if the facility causes or contributes to an AAQS or PSD increment violation. While no modeling was completed specifically for this EIS, modeling supplied by ICP was used to evaluate project impacts and to compare to state and federal standards and PSD increments. This modeling was performed such that all results were generated based on preliminary PTE emissions for facility operations.

However, PSD permit applications are not required to, and traditionally do not, address other air quality impacts associated with the proposed action which must be evaluated under NEPA requirements. Such other impacts include air pollutant emissions resulting from construction activity and mobile emissions utilized in the operation of the mine, processing plant, and loadout.

The analysis method for the EIS, therefore, would consist of the typical impact assessments conducted under a PSD permit application for the operation of stationary sources and a quantitative assessment of the emissions and qualitative assessment of impacts from construction emissions and mobile emissions. All aspects of the analysis, emission inventory development and modeling, were completed based on best available information. While it is common that estimated project emissions and therefore modeled impacts would change as facility planning is refined between now and the final PSD application, these changes are expected to be minor and are unlikely to change the conclusions drawn from this analysis. Further, a requirement of the PSD permit application process is that the air quality analysis for the facility demonstrates that the facility would not cause or contribute to an AAQS or PSD increment violation.

4.5.3 Assumptions

The assumptions used to arrive at the conclusions as part of the air quality analysis include the following:

- The air pollutant emission rates for the proposed facility based upon preliminary engineering design information, as provided by ICP (Class One 2012a), are assumed to accurately reflect current plans for the facility as defined under the PSD permitting process.
- The operating scenarios for construction activities and operations mobile equipment provided by ICP (Class One 2012a; ICP 2012a,b,c) are assumed to accurately reflect current plans.
- Modeling results for operation sources combined with professional knowledge about the dispersion characteristics of fugitive dust sources are useful for qualitatively assessing the impacts from the construction sources and operation mobile sources.

Environmental impacts to air resources would be significant if the Proposed Action or other action alternatives result in any of the following:

- Exceedence of National or State AAQS.
- AQRV impacts at Class I areas.

4.5.4 No Action Alternative

Under the No Action Alternative, the proposed project would not be developed, and the associated air quality impacts would not occur.

4.5.5 Alternative A—Proposed Action

The Proposed Action would include new emissions sources from the proposed mine and processing facility and Jal loadout. Operations sources would include permitted stationary and fugitive sources and unpermitted mobile sources. Emissions from mobile sources are not typically evaluated in the air quality permitting process because these emissions are controlled via separate regulations from those covering stationary sources. Additional temporary sources mostly consisting of mobile and non-road engines would be involved in construction of the mine, processing plant, and loadout.

4.5.5.1 Air Emissions

Construction Emissions

During construction, temporary sources mostly consisting of mobile and non-road engines would be involved in mine and facility construction. These vehicles would have combustion emissions as well as fugitive dust emissions while traveling on paved and unpaved roads. Additionally, there would be fugitive dust emissions from surface disturbances associated with the construction process. Specific activities evaluated included the construction of prepared surfaces, access roads, mine shaft and ramp, power lines, pipelines, ponds, and buildings.

The emissions for these activities were calculated from data provided by ICP (2012a, 2012b, 2012c, 2012d) and the emission factors found in USEPA AP-42 (USEPA 1995). A brief summary of the emissions from these sources is shown in **Table 4.5-1**. It should be noted that while the emissions estimates for construction equipment are based on the best available information uncertainty remains in the exact types and models of each piece of equipment and the activity data (hours of usage, distance traveled etc.) associated with that equipment.

Table 4.5-1 Annual Emissions (tpy) Not Considered in the PSD PTE Emission Inventory

Sources	NO_X	CO	SO_2	VOC	PM_{10}	$PM_{2.5}$
Emissions from the Construction of the Mine, Processing Facility, and Loadout	55.3	31.5	0.1	11.7	2,939.6	381.2
Mobile Sources Used During Mine, Processing Facility, and Loadout Operations	68.2	70.8	0.1	20.7	1.8	1.7

Operations Mobile Source Emissions

During operations mobile sources are utilized for mine, processing plant and loadout operations. Mobile source emission estimates include tail pipe and fugitive dust emissions from heavy equipment and vehicles used during operations. Specific activities evaluated included:

- Tail pipe emissions from onsite heavy and light duty trucks
- Tail pipe emissions from non-road mobile equipment
- Tail pipe emissions from haul road traffic
- Onsite fugitive dust from non-road mobile equipment usage
- Haul road fugitive dust from haul road traffic
- Yard locomotive emissions

The emissions for these activities were calculated from data provided by ICP (ICP 2012a,b,c) and the emission factors found in USEPA AP-42 (USEPA 1995). A brief summary of the emissions from these sources is shown in **Table 4.5-1**.

Operations PTE Source Emissions: Offsite Power Supply Option

Based on preliminary design specifications maximum PTE emissions from the processing of the polyhalite into sellable material and handling of those materials were calculated (Class One 2012a) and are summarized in **Table 4.5-2**. The source inventory evaluated and the estimated emissions by source are presented in **Tables 4.5-3** and **4.5-4**. Most emission sources, stationary and fugitive, would be controlled. These emissions were calculated based on preliminary Best Available Control Technology emission factors where applicable and using established emission factors from sources such as USEPA's AP-42 document (Class One 2012a).

Table 4.5-2 Annual PTE Emissions (tpy) for the Processing Facility and Loadout Operations

Sources	NO_X	CO	SO_2	VOC	TSP	PM_{10}	$PM_{2.5}$	Formaldehyde
Processing Facility	110	167	3	25	105	97	94	0.3
Jal Loadout	0	0	0	0	14	8	6	0
Total	110	167	3	25	119	106	100	0.3

Source: Class One 2012a.

Table 4.5-3 Emissions Source Inventory: Processing Plant

Description	Source Type
Hot Water Boiler #1	Stationary
Hot Water Boiler #2	Stationary

Table 4.5-3 Emissions Source Inventory: Processing Plant

Description	Source Type
Cooling Towers	Stationary
Polyhalite Decomposition Kiln	Stationary
SOP Product Dryer	Stationary
SOP Granulator Dryer	Stationary
Langbeinite Product Dryer	Stationary
Langbeinite Granulator Dryer	Stationary
SOP Granulator Fugitive	Fugitive
Langbeinite Granulator Fugitive	Fugitive
Run of Mine Pile Fugitive Emissions	Fugitive
Run of Mine Pile Reclaimer	Fugitive
Waste Material to Tailings Pile	Fugitive
Product Truck Fugitive Road Emissions	Fugitive

Table 4.5-4 Emissions Source Inventory: Jal Loadout

Description	Source Type
SOP Feeder Load and Loadout	Fugitive
SOP Dome Storage Loading	Fugitive
SOP Dome Storage Unloading	Fugitive
SOP Screen/Hopper/Conveyor	Fugitive
SOP Train Loading Bin	Fugitive
SOP Train Loading	Fugitive
Langbeinite Feeder Load and Loadout	Fugitive

Operations PTE Source Emissions: Onsite Power Supply Option

Under the onsite power supply option direct emissions would be increased for all criteria pollutants (**Table 4.5-5**). It is worth noting that because of the efficiency gains associated with cogeneration it is likely that total cumulative emissions from the project are likely reduced under this option.

Table 4.5-5 Annual PTE Emissions (tpy) for the Processing Facility and Loadout Operations

	NO_X	CO	SO_2	VOC	TSP	PM_{10}	$PM_{2.5}$	Formaldehyde
Total	542	258	4.6	42	143	129	123	0.57

Source: Class One 2012a.

4.5.5.2 Ambient Air Quality Analysis

Ambient Air Quality Impacts from Construction Sources and Operations Mobile Sources

The modeling analysis did not include emissions from construction or operations mobile sources. Therefore the impacts from construction sources and operations mobile must be evaluated qualitatively by comparison to the PTE emission inventory.

Annual construction emissions are less than annual PTE operation emissions for NO_X, CO, SO_2, and VOC, so the modeled impacts discussed below are a reasonable proxy for the construction scenario for these pollutants. The fugitive dust emissions from construction would be higher than those estimated from facility and loadout operations. The fugitive dust emissions are temporary in nature and would have minimal impacts on ambient air quality due to their generation mechanism, which does not typically result in long distance dispersion of the emissions.

Similarly the operations emissions from mobile sources are less than annual PTE operation emissions so the modeled impacts are a reasonable proxy for the emissions from these sources.

Ambient Air Quality Impacts from PTE Sources: Offsite Power Generation Option

PSD applications require an ambient air quality analysis for the directly emitted criteria pollutants. This is typically done using USEPA-approved dispersion models and methods. The first step in the analysis is to determine which, if any, pollutants have potentially major ambient air quality impacts. The next step is to assess for those pollutants that would have significant impacts if the facility causes or contributes to an AAQS or PSD increment violation. This process is based upon the PTE emissions inventory for the facility and the dispersion models and methods.

While the air quality analysis for the PSD permit application has not yet been completed, ICP conducted preliminary air dispersion modeling using five years of meteorological data and the USEPA-approved AERMOD dispersion model to evaluate the need for ambient data collection. This modeling was conducted in accordance with the draft modeling protocol developed for the project (Class One 2012b) and utilized the preliminary PTE emissions inventory (Class One 2012a). The modeling was configured to evaluate project compliance with state and federal ambient air quality standards and PSD increment consumption.

The first step in a PSD air quality analysis is to assess if the impacts beyond the property “fenceline” would be significant based on PSD modeling significance levels for those pollutants with emissions greater than the significant emission rate (20.2.74 NMAC). For pollutants and averaging periods that fall below the significance level based on this preliminary analysis no additional analysis is required. The maximum predicted impacts for CO and SO_2 for all averaging periods were below the modeling significant impact levels, as shown in **Table 4.5-6**; therefore, additional modeling was not required by the regulatory agency for these pollutants and averaging periods.

Compliance with the AAQS must be assessed for pollutants and averaging periods that are found to be significant during the significance analysis. This is done with a cumulative AAQS analysis that includes all existing sources either explicitly in the modeling or included in representative background concentrations.

An AAQS Analysis was conducted for TSP, PM_{10}, $PM_{2.5}$, and NO_2. The results of the AAQS modeling are presented in **Table 4.5-7** along with background values and national and state ambient standards. The most conservative approach is to compare the maximum modeled results (H1H) plus the background concentration to the standard. According to New Mexico modeling guidelines, background concentrations for NO_2, CO, and SO_2 do not apply in the project area, so only the modeled concentrations were compared to the ambient air quality standards to determine compliance. Background concentrations for TSP, PM_{10}, and $PM_{2.5}$ are added to the modeled concentrations to determine compliance.

Table 4.5-6 Summary of Modeling Analysis: Offsite Power Generation Option

Pollutant	Averaging Period	Modeled Results (μg/m³)[1,2]	Class II Modeling Significance Levels (μg/m³)	NAAQS (μg/m³)	NMAAQS (μg/m³)
CO	8-hour	19.6	500	10,000	8,853
	1-hour	77.9	2,000	40,000	13,329
SO_2	Annual	0.047	1.0		
	24-hour	0.27	5.0		
	3-hour	0.71	25.0		
	1-hour	1.26	8		
NO_2	Annual	6.9	1.0	100	84
	24-hour	NA	5.0	—	167
	1-hour	54.4	5.0	188	—
$PM_{2.5}$	Annual	3.8	0.3	12	—
	24-hour	13.5	1.2	35	—
PM_{10}	24-hour	43.4	5.0	150	—
TSP	Annual	11.7	1.0	—	60
	24-hour	108	5.0	—	150

[1] Results are maximum (H1H) modeled impacts.

[2] Source: Class One 2012c.

Table 4.5-7 Summary of AAQS Analysis Modeling: Offsite Power Generation Option

Pollutant	Averaging Period	Modeled Results with Background (μg/m³)[1,2]	NAAQS (μg/m³)	NMAAQS (μg/m³)
NO_2	Annual	11.9	100	84
	1-hour	104.6	188	—
$PM_{2.5}$	Annual	10.0	12	—
	24-hour	25.4	35	—
PM_{10}	24-hour	81.7	150	—
TSP	Annual	39.8	—	60
	24-hour	108	—	150

[1] Results are H1H modeled impacts.

[2] Source: Class One 2012c.

A PSD increment is a maximum allowable increase in ambient air concentrations in attainment areas. In effect, the increment is a "tertiary" air quality standard defining an acceptable increase in concentration from a historical baseline level. A source's impact cannot exceed this "incremental" increase. The intent is to prevent significant deterioration of the air quality. Emissions of NO_x, PM_{10} and $PM_{2.5}$ under the Proposed Action would consume increment because the minor source baseline date for these pollutants has been set. The results of the NO_2, PM_{10}, and $PM_{2.5}$ PSD increment analysis (H1H) are presented in **Table 4.5-8**.

Table 4.5-8 Summary of PSD Increment Modeling Results: Offsite Power Generation Option

Pollutant	Averaging Period	Modeled Results ($\mu g/m^3$) [1,2]	Class II Increment ($\mu g/m^3$)
NO_2 [3]	Annual	6.9	25
PM_{10}	24-hour	26.1	30
$PM_{2.5}$	Annual	3.8	4
	24-hour	9.7	9

[1] Results are H1H modeled impacts.

[2] Source: Class One 2012c.

[3] NO_2 modeled results are the AAQS analysis results which include additional sources and is therefore a conservative analysis of the increment consumption form the project.

While the results in **Table 4.5-8** based on preliminary emission inventory results show violation of the 24-hour $PM_{2.5}$ Increment Standard, the project would not be able to get a PSD air quality permit without first demonstrating compliance with all standards. In a refined analysis the form of the $PM_{2.5}$ 24-hour increment analysis allows for comparison of the second highest value (H2H) to the standard because the form of the standard allows for one exceedence per year. These results were not available in the preliminary analysis results provided for this EIS. Alternately additional control measures could potentially be employed to reduce emissions and show impacts below the threshold.

Ambient Air Quality Impacts from PTE Sources: Onsite Power Generation Option

Impacts from the onsite power generation option were analyzed utilizing the same methodology as employed for assessing the impacts from the offsite power generation option, Similarly, the maximum predicted impacts for CO and SO_2 for all averaging periods were below the modeling significant impact levels, as shown in **Table 4.5-9**; therefore, additional modeling was not required by the regulatory agency for these pollutants and averaging periods.

Table 4.5-9 Summary of Modeling Analysis: Onsite Power Generation Option

Pollutant	Averaging Period	Modeled Results ($\mu g/m^3$)[1,2]	Class II Modeling Significance Levels ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	NMAAQS ($\mu g/m^3$)
CO	8-hour	16.9	500	10,000	8,853
	1-hour	50.9	2,000	40,000	13,329

Table 4.5-9 Summary of Modeling Analysis: Onsite Power Generation Option

Pollutant	Averaging Period	Modeled Results (µg/m^3)[1,2]	Class II Modeling Significance Levels (µg/m^3)	NAAQS (µg/m^3)	NMAAQS (µg/m^3)
SO_2	Annual	0.046	1.0		
	24-hour	0.19	5.0		
	3-hour	0.39	25.0		
	1-hour	0.83	8		
NO_2	Annual	2.1	1.0	100	84
	24-hour	NA	5.0	—	167
	1-hour	35.4	5.0	188	—
$PM_{2.5}$	Annual	3.8	0.3	12	—
	24-hour	13.5	1.2	35	—
PM_{10}	24-hour	43.4	5.0	150	—
TSP	Annual	10.3	1.0	—	60
	24-hour	52.3	5.0	—	150

1 Results are maximum (H1H) modeled impacts.

2 Source: Class One 2012d.

An AAQS Analysis was conducted for TSP, PM_{10}, $PM_{2.5}$, and NO_2. The results of the AAQS modeling are presented in **Table 4.5-10** along with background values and national and state ambient standards.

Table 4.5-10 Summary of AAQS Analysis Modeling: Onsite Power Generation Option

Pollutant	Averaging Period	Modeled Results with Background (µg/m^3)[1,2]	NAAQS (µg/m^3)	NMAAQS (µg/m^3)
NO_2	Annual	7.1	100	84
	1-hour	85.6	188	—
$PM_{2.5}$	Annual	10	12	—
	24-hour	25.4	35	—
PM_{10}	24-hour	81.7	150	—
TSP	Annual	38.4	—	60
	24-hour	102.2	—	150

1 Results are H1H modeled impacts.

2 Source: Class One 2012d.

3 NO_2 modeled results are the AAQS analysis results which include additional sources and is therefore a conservative analysis of the increment consumption form the project.

The results of the NO_2, PM_{10} and $PM_{2.5}$ PSD increment analysis (H1H) are presented in **Table 4.5-11**. In a refined analysis the form of these short term standards allow for comparison of the second highest value (H2H) to the standard because the form of the standard allows for one exceedence per year. These results were not available in the preliminary analysis results provided for this EIS.

Table 4.5-11 Summary of PSD Increment Modeling Results: Offsite Power Generation Option

Pollutant	Averaging Period	Modeled Results ($\mu g/m^3$) [1,2]	Class II Increment ($\mu g/m^3$)
NO_2[3]	Annual	2.1	25
PM_{10}	24-hour	26.1	30
$PM_{2.5}$	Annual	3.0	4
	24-hour	8.97	9

[1] Results are H1H modeled impacts.

[2] Source: Class One 2012d.

While the annual emissions in the onsite power generation alternative are higher, the modeled impacts are generally lower. This is likely due to the different dispersion characteristics of the onsite power generation equipment as compared to the boilers modeled under the offsite power generation alternative. The results in **Tables 4.5-10** and **4.5-11** based on preliminary emission inventory results show no violations of the AAQS or PSD increment standards.

<u>Ozone Impacts</u>

Ozone impacts are not generally assessed under the PSD air quality analysis process and cannot be assessed using dispersion modeling techniques because ozone would not be directly emitted from facility operations. Photochemical modeling can be used to assess a project's impacts on regional ozone levels. Photochemical modeling is not routinely used for this purpose. Instead the air quality permitting process protects the ozone AAQS by controlling the precursors NO_x and VOCs.

Because ozone generation is a function of chemical reactions between NO_X and VOCs in the presence of ultraviolet radiation, potential ozone impacts can be qualitatively evaluated based upon the emissions of NO_X and VOCs from the project as compared to county-wide emissions. As noted in **Table 4.5-2**, PTE emissions are 542 and 42 tpy respectively for NO_X and VOCs under the onsite power generation alternative. In comparison, the total NO_X and VOC emissions in Lea County based upon 2008 emissions data are 14,027 tpy for NO_X and 3,400 tpy for VOCs (USEPA 2012c).

As the projected NO_X and VOC emissions from the project would be less than 4 and 2 percent, respectively, of the Lea County emissions, it can be determined that project emissions would result in a negligible contribution to the regional ozone ambient concentrations.

<u>AQRV Analysis</u>

AQRVs that are commonly evaluated in air quality impact studies include visibility, soil and lakes. FLMs' report (FLAG 2010) provides a screening analysis to determine if a proposed project is exempt from AQRV impact review based on its annual emissions (Q) and distance (D) from a Class I area.

A Q/D screening analysis was performed to evaluate the impact of the Proposed Action on AQRVs in the closest Class I area or sensitive Class II area, Carlsbad Caverns NP (**Figure 3.5-1**). In this analysis the Q/D ratio defined as the ratio of applicable project emissions in tpy and distance in km to the selected area is compared to the FLAG threshold of 10. The pollutants which were considered in this analysis are SO_2, NO_X, and PM_{10}. A complete review also would require analysis of sulfuric acid (H_2SO_4). Sulfuric acid emissions were not quantified as part of this effort and are assumed to be negligible.

Based upon the 2008 FLAG Q/D methodology, emissions of SO_2+NO_X+PM_{10}+H_2SO_4 in tpy from the PTE emissions inventory for the onsite power generation alternative (5+542+129) divided by the distance to the nearest Class I area, Carlsbad Caverns NP, in kilometers (75 km) results in a value of 9.0. The results of this screening analysis indicate that the Proposed Action is exempt from further AQRV impact review.

4.5.6 Alternative B

Under Alternative B, there would be no change to the mining methods and operations, processing methods and buildings, and management of co-development described under the Proposed Action. There would be minor changes to construction of the tailings stockpile construction, depending on the option selected, but the difference to air quality impacts would be minimal compared to the Proposed Action.

4.5.7 Alternative C

Alternative C would not change the mining methods and operations and processing methods and buildings described under the Proposed Action. Therefore, air quality impacts would be the same as under the Proposed Action.

4.5.8 Alternative D

Alternative D would not change the mining methods and operations and processing methods and buildings described under the Proposed Action. Therefore, air quality emissions would be the same as under the Proposed Action. Given the shifted location of some sources, modeled impacts are expected to occur in different locations, resulting in minor differences from those predicted for the Proposed Action. Only a slight difference in magnitude is expected between Alternative D and Alternative A impacts, and they could be higher or lower depending on how the relative configurations of the sources and the modeled dispersion conditions combine to produce the estimated impacts. It is reasonable to assume that the conclusions drawn about the air quality impacts from Alternative A also are representative of the impacts expected under Alternative D.

4.5.9 Preferred Alternative

Under the Preferred Alternative, air quality impacts would be the same as under the Proposed Action.

4.5.10 Mitigation Measures

As recommended by the USEPA in comments on the Draft EIS, the BLM will encourage the use of equipment that meets USEPA's Highway Diesel and Nonroad Diesel Rules for project construction and maintenance operations.

4.5.11 Summary of Impacts

Impacts to air quality would be similar across all of the action alternatives. While initial modeling results show violations of the $PM_{2.5}$ increment standard, no significant adverse impacts to air quality would occur under any alternative because a PSD permit is required to construct the facility. ICP submitted air quality modeling to the NMED-AQB in December, 2013, in support of the PSD permit application for the project. The modeling demonstrates that state and federal air quality standards, including increments, would not be exceeded and that AQRVs would be protected.

No long-term residual impacts to air quality from implementation of the proposed project would occur because reclamation and revegetation would stabilize exposed soil and control fugitive dust emissions.

As vegetation becomes established following reclamation, PM emission levels should return to what is typical for an arid environment.

4.5.12 Cumulative Impacts

Activities such as oil and gas development and operations, new building construction, and increased vehicle traffic (primarily due to transporting marketable mine products and oil and gas service vehicles) would contribute to impacts to air quality in the region, depending on the activity and the emissions generated. When a PSD permit application is submitted, the NMED verifies that the facility to be constructed will not cause or contribute to a violation of state or federal ambient air quality standards and that PSD increments are not exceeded prior to issuance of a PSD construction air quality permit. While this cumulative air quality analysis only includes existing sources, future sources also will be required to make the same demonstration prior to air quality permit issuance, thus ensuring the protection of ambient air quality standards in a manner consistent with all state and federal air quality regulations.

4.6 Climate and Greenhouse Gas Emissions

4.6.1 Issues

Recent scientific evidence suggests there is a direct correlation between climate change and emissions of GHGs. Although many GHGs occur naturally in the atmosphere, human-caused sources have substantially increased the emissions of GHGs since the Industrial Revolution. The primary issues related to climate change include the potential contribution of GHGs by the project.

4.6.2 Assumptions and Method of Analysis

Climate change analyses are comprised of many factors, including GHGs, land use management practices, and the albedo effect. The tools necessary to quantify climatic impacts from this small-scale project are presently unavailable. Therefore, climate change analysis for the purpose of this document is limited to accounting and disclosing factors that contribute to climate change.

The GHG Protocol categorizes direct and indirect emissions into three broad scopes:

- Scope 1: All direct GHG emissions.
- Scope 2: Indirect GHG emissions from consumption of purchased electricity, heat or steam.
- Scope 3: Other indirect emissions.

Both direct (Scope 1) and indirect (Scope 2) emissions were calculated and the results used to evaluate project impacts that may affect climate change.

4.6.3 No Action Alternative

Under the No Action Alternative, the proposed project would not be developed, and any associated climate change impacts would not occur.

4.6.4 Alternative A—Proposed Action

Both direct (Scope 1) and indirect (Scope 2) annual emissions were estimated for the Proposed Action. Source emissions for the Proposed Action are listed in **Table 4.6-1**.

Direct emissions of GHGs result from a variety of activities associated with the mining industry that involve the combustion of fossil fuels. Indirect emissions of GHG from electricity consumption also are associated with the mining industry (see **Table 4.6-2**).

Table 4.6-1 GHG Source Emissions Under The Proposed Action: Offsite Power Generation

Project Phase	Emission Scope	Source Types	CO_2 (tpy)	CH_4 (tpy)	N_2O (tpy)	CO_2e (tpy)
Construction	Scope 1	Construction	6,271	0	0	6,292
	Scope 2		0	0	0	0
	Total	All	6,271	0	0	6,292
Operations	Scope 1	Mobile Operations	9,450	0	0	9,482
	Scope 1	PTE Operations	527,787	10	3	528,896
	Scope 2	Electricity Usage	985,233	15	13	989,708
	Total	**All**	**1,522,470**	**25**	**16**	**1,528,086**

Table 4.6-2 GHG Source Emissions Under The Proposed Action: Onsite Power Generation

Project Phase	Emission Scope	Source Types	CO_2 (tpy)	CH_4 (tpy)	N_2O (tpy)	CO_2e (tpy)
Construction	Scope 1	Construction	6,271	0	0	6,292
	Scope 2		0	0	0	0
	Total	All	6,271	0	0	6,292
Operations	Scope 1	Mobile Operations	9,450	0	0	9,482
	Scope 1	PTE Operations	665,831	12	1	666,438
	Scope 2	Electricity Usage	0	0	0	0
	Total	**All**	**687,823**	**12**	**1**	**688,504**

In the entire State of New Mexico, the total GHG emissions from all sources was approximately 76 million metric tons of CO_2e (NMED 2010c) in 2007. In comparison, the total (direct and indirect) emissions of GHG from the Proposed Action would be approximately 1.5 million tons or less than 2 percent of the New Mexico GHG budget. Impact assessment of specific project-related activities cannot be determined.

4.6.5 Alternative B

Under Alternative B, there would be no change to the mining methods and operations or processing methods and buildings compared to the Proposed Action. Therefore, climate change impacts would be the same as under the Proposed Action.

4.6.6 Alternative C

Under Alternative C, there would be no change to the mining methods and operations or processing methods and buildings compared to the Proposed Action. Therefore, climate change impacts would be the same as under the Proposed Action.

4.6.7 Alternative D

Under Alternative D, there would be no change to the mining methods and operations or processing methods and buildings compared to the Proposed Action. Therefore, climate change impacts would be the same as under the Proposed Action.

4.6.8 Preferred Alternative

Under the Preferred Alternative, there would be no change to the mining methods and operations or processing methods and buildings compared to the Proposed Action. Therefore, climate change impacts would be the same as under the Proposed Action.

4.6.9 Mitigation Measures

Impacts to climate change from the proposed project would be minor so no additional mitigation measures are recommended.

4.6.10 Summary of Impacts

Impacts to greenhouse gas emissions would be similar across all of the action alternatives. Impact assessment of specific project-related activities cannot be determined.

4.6.11 Cumulative Impacts

In 2001, the IPCC projected that by the year 2100, global average surface temperatures could increase by 2.5 to 10.4°F above 1990 levels. The National Academy of Sciences (2010) has confirmed these projections, but also indicated that there are uncertainties regarding how climate change may affect different regions. Computer model predictions indicate that increases in temperature would not be equally distributed, but are likely to be accentuated at higher latitudes. Warming during the winter months is expected to be greater than during the summer, and increases in daily minimum temperatures have been observed to increase in the region during the last few decades, while there are no strong indications of increases in daily maximum temperatures. Although large-scale spatial shifts in precipitation distribution may occur, these changes are more uncertain and difficult to predict.

The scope of the climate change phenomenon is global, so past, present, and reasonably foreseeable actions from around the globe, together with the actions contemplated in the alternatives, affect atmospheric greenhouse gas levels. Actions from around the globe that are generally attributed to increased atmospheric greenhouse gas levels include the burning of fossil fuels for electricity, manufacturing, and transportation; deforestation and land surface change; agricultural and livestock operations; and fugitive methane emissions associated with pipelines and coal/oil/natural gas production. The effects of global climate change may include sea level rise, changing global climate patterns, redistribution of plant and animal species, redistribution of disease vectors, and altered precipitation regimes.

Activities such as oil and gas development and operations, new building construction, and vehicle traffic contribute to global climate change. There is no way to evaluate the contribution of these reasonably foreseeable activities without details regarding the types of activities and their locations, but regional factors contributing to climate change are not likely to be significantly affected by these activities in combination with the proposed project. It is not possible to link any particular set of greenhouse gas emissions to specific climate-related environmental effects.

4.7 Vegetation

4.7.1 Issues

The primary issues associated with vegetation resources include:

- Damage to vegetative cover and diversity, changes in surface water flow, loss of special status plant species, and forage in rangeland areas.
- The introduction or spread of noxious weeds and invasive plants.
- The loss of vegetative cover due to trampling, soil compaction, and the direct removal of vegetation resulting from surface-disturbing activities, construction and production activities, and aboveground facilities.

4.7.2 Method of Analysis

Potential impacts to vegetation resources were determined based on the locations of these resources in relation to the proposed surface disturbance areas. Applicant-committed environmental protection measures and BLM regulations were assumed to be implemented in determining significant impacts. Because the specific proposed new water well locations and access roads are unknown within the well field, the acreage of vegetation affected in the well field was estimated as proportional to each vegetation type within the well field area.

4.7.3 Assumptions

The following assumptions were used in the analysis of impacts to vegetation resources:

- Areas of recently disturbed bare ground would be more susceptible to erosion and invasion by non-native species.
- Erosion from disturbed areas would be minimal once vegetation or other surface stabilization is established. Successful establishment of herbaceous vegetation generally takes a minimum of 3 to 5 years, depending on soil, irrigation, and precipitation, and requires monitoring until the BLM determines the reclamation to be successful.
- Extensive networks of roads and utility corridors can lead to fragmentation of native landscapes, which can decrease species diversity, lead to decrease in the number and populations of native and special status species, and provide corridors for invasion of non-native species.
- Areas with rehabilitation constraints (e.g., highly erodible or droughty soils, low precipitation amounts, etc.) can have little to no reclamation success, unless additional mitigation measures are implemented.
- Surface disturbance activities result in the conversion of shrub and tree-dominated vegetation cover types to grass/forb-dominated vegetation in the short term.

The thresholds for significant impacts to vegetation are dependent on the extent of surface impacts and the length of time necessary for the native vegetative communities to recover following surface disturbance. Impacts to vegetation resources would be significant if the Proposed Action or alternatives result the introduction of noxious weed species into the project area, or the spread of existing invasive species into areas previously dominated by native plant species.

4.7.4 No Action Alternative

Under the No Action Alternative, the proposed project would not be approved. Current land use and surface-disturbing activities would continue.

4.7.5 Alternative A—Proposed Action

4.7.5.1 General Vegetation

Under the Proposed Action, 2,397 acres would be removed or impacted due to surface disturbance associated with construction and operation of the proposed mining project. Project-related surface disturbance activities include construction of the processing plant facilities, mine shaft, ramp, waste rock piles, pipelines, Jal loadout, and associated access roads. The majority of the disturbance would occur in the Mesquite Upland Scrub vegetation cover type. There would be minimal surface disturbance in the barren/unvegetated wash cover type. **Table 4.7-1** identifies the estimated acreage of project-related disturbance for construction activities by vegetation cover type within the project area. The distribution of vegetation cover types in the project area is shown in **Figure 3.7-1**. In addition, vegetation along existing and new access roads may be affected by a reduction in plant growth rate as a result of dust deposition until road surfaces are stabilized.

Table 4.7-1 Acreage of Vegetation Affected by Initial Disturbance under the Proposed Action Alternative

	Acres of Construction Impacts[1]									
	Plant Facilities		Jal Loadout[2]		Water Pipeline		Mine Surface Facilities[3]		Well Field[4]	
Vegetation Cover Type	**acres**	**%**	**acres**	**%**	**acres**	**%**	**acres**	**%**	**acres**	**%**
Creosote Desert Scrub	12	<1	2	<1	--	--	2	<1	--	--
Mixed Desert Scrub Steppe	34	<1	52	<1	1	<1	4	<1	1	<1
Mesquite Upland Scrub Steppe	1,796	6	397	1	23	<1	30	<1	20	<1
Coppice Dune and Sand Flat Scrub	--	--	16	<1	7	<1	--	--	2	<1
Shinnery Oak Shrubland	--	--	21	<1	--	--	--	--	--	--
Barren /Developed	--	--	--	--	15	<1	--	--	--	--
Barren/ Unvegetated Wash	--	--	--	--	<1	<1	--	--	--	--
Total	**1,842**	**6**	**488**	**2**	**48**	**<1**	**36**	**<1**	**23**	**<1**

1 Project components overlap so total acreage of vegetation cover types do not equal the total surface disturbance in **Table 2-3**. Three acres of existing access roads associated with the construction of the water pipeline are not included in acres of affected vegetation.

2 Jal loadout includes acres of disturbance for the loadout area and proposed access roads.

3 Mine surface facilities include the mine shaft and ramp.

4 The acreage of vegetation affected in the well field was estimated as proportional to each vegetation type within the well field area.

Short-term impacts from project-related activities would include the crushing of herbaceous vegetation and removal of vegetation during construction activities. Indirect effects to vegetation may include increased soil erosion from disturbed areas, sedimentation, fugitive dust generation, the spread and establishment of noxious and invasive weed species.

Table 4.7-2 identifies estimated acreage of project-related disturbance associated with permanent disturbance by vegetation cover type within the project area. Long-term impacts would include the loss of vegetation for permanent facilities during the life of the project or longer, and the conversion of shrub-dominated cover types to grass/forb-dominated vegetation due to surface clearing activities and changes in soil chemistry from operational activities. Biological soil crusts damaged during construction activities could affect the health and successful restoration of native vegetative communities.

Table 4.7-2 Acreage of Vegetation Affected Long Term under the Proposed Action Alternative

	Acres of Permanent Impacts[1]									
	Plant Facilities		Jal Loadout[2]		Water Pipeline		Mine Surface Facilities[3]		Well Field[4]	
Vegetation Cover Type	**acres**	**%**	**acres**	**%**	**acres**	**%**	**acres**	**%**	**acres**	**%**
Creosote Desert Scrub	8	<1	1	—	—	—	1	—	—	—
Mixed Desert Scrub Steppe	24	<1	34	<1	—	—	3	<1	1	—
Mesquite Upland Scrub Steppe	1,257	4	263	<1	—	—	24	<1	20	<1
Coppice Dune and Sand Flat Scrub	—	—	11	<1	—	—	—	—	2	<1
Shinnery Oak Shrubland	—	—	14	<1	—	—	—	—	—	—
Barren /Developed	—	—	—	—	—	—	—	—	—	—
Barren/ Unvegetated Wash	—	—	—	—	—	—	—	—	—	—
Total	**1,289**	**4**	**323**	**1**	—	—	**28**	**<1**	**23**	**<1**

[1] Project components overlap so total acreage of vegetation cover types do not equal total surface disturbance from **Table 2-3**.

[2] Jal loadout includes acres of disturbance for the loadout area and proposed access roads.

[3] Mine surface facilities include the mine shaft and ramp.

[4] The acreage of vegetation affected in the well field was estimated as proportional to each vegetation type within the well field area.

4.7.5.2 Special Status Species

There are no federal, state, or county listed plant species for Lea County, therefore no impacts to special status plant species are anticipated.

4.7.5.3 Wetland and Riparian Areas

No wetlands or riparian areas would be affected by the Proposed Action. There is less than one acre of disturbance associated with the barren/unvegetated wash cover type within the water pipeline ROW. The ephemeral wash flows northwest to southeast across the proposed pipeline route and drains southeast toward Antelope Draw. There are no waters of the U.S. in the project area (USACE 2013).

4.7.5.4 Invasive Plants

Indirect effects on vegetation would include the spread of noxious and invasive species, fugitive dust, and fragmentation of vegetative communities resulting from the development of the network of utility ROWs, access roads, and pipelines.

Surface disturbance and increased vehicle travel along new routes may readily spread noxious weeds and invasive plant species and colonize areas that have minimal vegetation cover or areas that have been recently disturbed. Noxious weed species can degrade and modify native communities, reduce resources for native species, and adversely affect native pollinators. The presence of African rue in the project area could lead to the further spread of this species into the areas disturbed by the proposed project. Implementation of BLM environmental protection measure 2.14.1, and those applicable to African rue (BLM Environmental Requirement 2.14.2), listed in **Table 2-6** and **Appendix A**, would minimize the spread of invasive plants in and around the project area.

Impacts to vegetation resources would be minimized through the implementation of the environmental protection measures outlined in Section 2.4.7. During construction, these measures would minimize adverse surface impacts, stabilize growth media, reduce soil erosion, and minimize the potential for the establishment of noxious weeds and invasive species.

4.7.6 Alternative B

Under Alternative B, impacts to the project area would be similar to that described for the Proposed Action. The exception under Alternative B would be that the footprint of the dry stack tailings stockpile may be different from the Proposed Action. A larger footprint would result in more surface disturbance and may permanently modify up to 22 percent more acres of vegetation under one option. It also may permanently alter less acreage if the tailings stockpile were to be reduced.

4.7.7 Alternative C

Under Alternative C, impacts to vegetation would be the same as under the Proposed Action.

4.7.8 Alternative D

Under Alternative D, 2,398 acres would be removed or impacted due to surface disturbance associated with construction and operation of the proposed mining project. Project-related surface disturbance would be similar to the Proposed Action except for the different location of the processing facilities. **Table 4.7-3** identifies the estimated acreage of project-related disturbance for construction activities by vegetation cover type within the project area. The kinds of direct and indirect impacts to vegetation communities in the project area would be similar to that described for the Proposed Action.

Table 4.7-3 Acreage of Vegetation Affected by Initial Disturbance under Alternative D

	Acres of Construction Impacts[1]									
	Plant Facilities		Jal Loadout[2]		Water Pipeline		Mine Surface Facilities[3]		Well Field[4]	
Vegetation Cover Type	acres	%	acres	%	acres	%	acres	%	acres	%
Creosote Desert Scrub	332	1	2	<1	—	—	2	<1	—	—
Mixed Desert Scrub Steppe	107	<1	52	<1	1	<1	4	<1	1	<1
Mesquite Upland Scrub Steppe	1,355	4	397	1	23	<1	30	<1	20	<1
Coppice Dune and Sand Flat Scrub	—	—	16	<1	7	<1	—	—	2	<1
Shinnery Oak Shrubland	49	<1	21	<1	—	—	—	—	—	—
Barren /Developed	—	—	—	—	15	<1	—	—	—	—
Barren/ Unvegetated Wash	—	—	—	—	<1	<1	—	—	—	—

Table 4.7-3 Acreage of Vegetation Affected by Initial Disturbance under Alternative D

	Acres of Construction Impacts[1]									
	Plant Facilities		Jal Loadout[2]		Water Pipeline		Mine Surface Facilities[3]		Well Field[4]	
Vegetation Cover Type	**acres**	**%**	**acres**	**%**	**acres**	**%**	**acres**	**%**	**acres**	**%**
Playa	<1	<1	—	—	—	—	—	—	—	—
Total	**1,843**	6	**488**	**2**	**48**	**<1**	**36**	**<1**	**23**	**<1**

1 Project components overlap so total acreage of vegetation cover types do not equal the total surface disturbance in **Table 2-3**. Three acres of existing access roads associated with the construction of the water pipeline are not included in acres of affected vegetation.

2 Jal loadout includes acres of disturbance for the loadout area and proposed access roads.

3 Mine surface facilities include the mine shaft and ramp.

4 The acreage of vegetation affected in the well field was estimated as proportional to each vegetation type within the well field area.

Table 4.7-4 identifies estimated acreage of project-related disturbance associated with permanent disturbance by vegetation cover type within the project area under Alternative D.

Table 4.7-4 Acreage of Vegetation Affected Long Term under Alternative D

	Acres of Permanent Impacts[1]									
	Plant Facilities		Jal Loadout[2]		Water Pipeline		Mine Surface Facilities[3]		Well Field[4]	
Vegetation Cover Type	**acres**	**%**	**acres**	**%**	**acres**	**%**	**acres**	**%**	**acres**	**%**
Creosote Desert Scrub	232	<1	1	—	—	—	1	—	—	—
Mixed Desert Scrub Steppe	75	<1	34	<1	—	—	3	<1	1	—
Mesquite Upland Scrub Steppe	948	3	263	<1	—	—	24	<1	20	<1
Coppice Dune and Sand Flat Scrub	—	—	11	<1	—	—	—	—	2	<1
Shinnery Oak Shrubland	35	<1	14	<1	—	—	—	—	—	—
Barren /Developed	—	—	—	—	—	—	—	—	—	—
Barren/ Unvegetated Wash	—	—	—	—	—	—	—	—	—	—
Total	**1,290**	**4**	**323**	**1**	—	—	**28**	**<1**	**23**	**<1**

1 Project components overlap so total acreage of vegetation cover types do not equal total surface disturbance from **Table 2-3**.

2 Jal loadout includes acres of disturbance for the loadout area and proposed access roads.

3 Mine surface facilities include the mine shaft and ramp.

4 The acreage of vegetation affected in the well field was estimated as proportional to each vegetation type within the well field area.

4.7.8.1 Special Status Species

There are no federal, state, or county listed plant species for Lea County. Therefore, no impacts to special status plant species are anticipated.

4.7.8.2 Wetland and Riparian Areas

There would be less than 1 acre of disturbance associated with the large playa on the northern edge of the plant facility boundary based on the available SWReGAP and NWI data for the area. Using on the aerial imagery, it appears the playa is quite variable in size, depending on the amount of precipitation. The proposed evaporation pond locations would extend into the playa, causing alteration of the surface water flow, erosion and sedimentation processes, and water retention in the playa. Playas are riparian areas that are important for wildlife species, providing diversity and habitat that in uncommon in this region. The playa is located in a closed basin which does not connect to a jurisdictional waterway as defined by the U.S. Army Corps of Engineers. There are no waters of the U.S. in the project area (USACE 2013).

Impacts to wetland and riparian areas at the Jal loadout, mine surface facilities, water pipeline, and well field are similar to those described for the Proposed Action.

4.7.9 Preferred Alternative

Under the Preferred Alternative, impacts to the project area would be similar to that described for the Proposed Action. The exception would be that slightly less acreage may be permanently altered if the tailings stockpile footprint were reduced.

4.7.10 Mitigation Measures

Recommended additional mitigation measures include the following:

- A noxious weed management plan should be developed that includes pre-construction surveys, education of construction and operation personnel, washing of vehicles and equipment before entering and leaving the project area during construction, herbicide spraying, and monitoring. The focus of noxious weed mitigation measures should be to keep the ROW clear of the noxious weeds of concern including Malta starthistle, African rue, Scotch thistle, and salt cedar.
- Monitoring of revegetation should occur for five years after mine closure. If revegetation is not successful based on BLM standards, the disturbed areas would be reseeded with the BLM approved seed mix. Additional mitigation measures may be required for reclamation success including soil amendments, noxious and invasive weed management, and fencing to prevent livestock and wildlife grazing until vegetation is established.
- Riparian area and wetland field surveys should be conducted within the boundary of the Alternative D processing plant site. The field surveys would outline the boundaries of any riparian and wetlands located in the alternative plant facility boundaries. Surface disturbance should be moved to be at least 100 feet from any wetlands. A vegetation buffer should be maintained between surface facilities and any wetlands or riparian areas.

4.7.11 Summary of Impacts

Impacts to vegetation resources would be the same under Alternatives A (Proposed Action) and C and similar under Alternative B and the Preferred Alternative, depending on the tailings stockpile option. Under Alternative D, there are potential adverse impacts to the playa and its associated riparian vegetation from construction of the evaporation ponds. Under all alternatives, there would be an alteration of vegetative cover types due to initial construction and long-term or permanent cover of vegetation by project structures. Final reclamation at the end of the project would minimize the overall reduction of vegetative cover to permanent structures like the tailings stockpile, which would be revegetated to be stabilized but not usable for other purposes. Under all action alternatives, surface-disturbing activities would include the long-term loss of 1,663 acres of native vegetation.

Implementation of a noxious weed management plan would minimize the potential for the spread and establishment of noxious weeds during construction activities and vehicle travel during project operations. However, noxious weeds and invasive species may persist over the long term regardless of the implementation of control programs. Implementation of additional monitoring and mitigation measures would assist in reclamation success.

4.7.12 Cumulative Impacts

Additional oil and gas development with construction of well pads, roads, and ancillary facilities would add to the total acreage of vegetation disturbed in the vicinity of the project area. Other construction and vegetation management activities would affect the extent and type of vegetation in the vicinity of the project area, but the locations of these future activities are not known well enough to quantify the cumulative impacts.

4.8 Wildlife and Fish

4.8.1 Issues

The primary issues related to wildlife and fisheries include:

- Potential impacts to special status species, especially the lesser prairie-chicken that would contribute to being federal listing under the ESA.
- Disruption of natural mammal and reptile movement corridors.
- Cumulative loss or disruption of habitat.
- Potential disruption of raptor nest sites or loss of nesting habitat.
- Potential adverse impacts to migratory birds and bat species from the creation of hypersaline evaporation ponds.

4.8.2 Method of Analysis

Potential impacts to wildlife and sensitive wildlife species were determined based on the locations of these resources in relation to the proposed surface disturbance areas. Correlations between the vegetation communities and habitat types were established. Using GIS, the locations of proposed surface disturbance were overlaid on the vegetation type layer to determine the amount of acreage to be altered within each habitat type due to project-related activities.

To determine if known populations or individuals of special status wildlife species would be affected, the locations of proposed project construction were overlaid on known GIS data to determine if known populations or individuals would be located within the planned areas of disturbance. In addition, where appropriate and reasonable, suitable habitat was identified for other species likely to occur where surface disturbance is projected to determine the amount of suitable habitat that would be lost due to the proposed project. Applicant-committed measures and BLM regulations were considered in determining impacts.

The potential impacts on terrestrial wildlife from implementation of the action alternatives can be classified as short-term and long-term. Short-term impacts may arise from habitat removal and disturbance as well as from activities associated with mining and processing operations. These impacts would cease upon mine closure and completion of successful reclamation. Long-term impacts consist of permanent changes to habitats and the wildlife populations that depend on those habitats, irrespective of reclamation success.

Direct impacts to wildlife populations could include direct mortality caused by construction activities, habitat loss or alteration, incremental habitat fragmentation, animal displacement, and the potential for increased vehicle-related mortalities. Indirect impacts could include increased noise and human presence that disrupts wildlife species.

4.8.3 Assumptions

The following assumptions were used in the analysis of impacts to wildlife and sensitive wildlife species resources:

- Installation of maintenance roads would increase disturbance of wildlife species and fragmentation of native habitat.
- Increased vehicle traffic would contribute to disruption of wildlife populations and movement corridors.
- Installation of new power lines associated with the processing facilities would increase the potential for migratory bird collisions with power lines. New power lines would increase the potential for roosting locations for raptors and other predatory birds.
- Installation and the continued use of saline evaporation ponds could increase the potential use of the ponds by migratory birds, bats, and other terrestrial wildlife species. Acute or chronic toxicity to migratory birds, bats, or terrestrial wildlife would occur if they came into contact with hypersaline water in the evaporation ponds.
- Increased human activities from construction, maintenance, and operations of mining and processing plant surface facilities, well field, pipelines, loadout facility, access roads, and evaporation ponds is likely to alter wildlife movement patterns and the use of native habitat, and increase the potential for wildlife mortality.

Environmental impacts to wildlife and fisheries would be significant if the action alternatives result in any of the following:

- Disturbance of federally threatened or endangered wildlife species or their critical habitat, or disturbance of USFWS species of concern or BLM sensitive species that contributes to their being listed as threatened or endangered.
- Adverse impacts to nesting raptor or passerine species protected under the MBTA, or loss of an active nest site, as a result of construction or operations during the breeding season.
- Destruction of active bat roosts or maternity sites.

The threshold for significant impacts to wildlife and sensitive species depends on the extent of surface impacts and the length of time necessary for native vegetative communities to recover following surface disturbance. Additionally, wildlife and sensitive species thresholds are dependent on the extent and duration of changes to habitat that would result from the long-term operations and maintenance of the proposed project. Impacts to wildlife or sensitive species would be significant if implementation of the proposed project results in one or more of the following:

- The loss of sensitive wildlife species populations or individuals that would adversely affect the ability of the species to maintain its current population status.
- Sensitive species habitat would be altered as part of the construction and maintenance of the proposed project.
- Migratory birds would be killed or injured by contact with proposed project facilities and activities.

4.8.4 No Action Alternative

Under the No Action Alternative, the proposed project would not be approved. Current land and resource uses would continue under current conditions in the project area. No ground-disturbing activities related to potash mining would occur in the project area so there would be no impacts to wildlife species.

4.8.5 Alternative A—Proposed Action

4.8.5.1 Terrestrial Wildlife

Potential impacts to wildlife species from the Proposed Action would result from the short-term and long-term loss of habitat within the project area from the construction of the processing plant site, associated mine surface facilities, well field, Jal loadout, and access roads. **Table 4.7-1** summarizes initial impacts to vegetation communities and associated habitat types and **Table 4.7-2** summarizes long-term impacts to vegetation communities and associated habitat types under Alternative A.

Other potential impacts to wildlife include increased vehicle traffic, increased human activity causing disruption of wildlife habitat in previously undisturbed areas, exposure to saline evaporation ponds constructed for the project, and increased habitat fragmentation. Effects on wildlife habitat or species would be the same for either power supply option.

Construction

Direct impacts to big game species (primarily pronghorn and mule deer) include the incremental loss of forage. However, these incremental losses of vegetation would represent a small percentage (less than 2.5 percent) of the overall available habitat within the project area. The loss of native vegetation would be long-term, most likely greater than 20 years after revegetation of disturbed areas not needed for project operations or completion of the project. Herbaceous species and grasses may become established within 3 to 5 years, depending on reclamation success. In most locations, suitable habitat adjacent to construction disturbance areas such as the new processing plant and mine facilities, roads, well pads, and Jal loadout facility would be available for big game species until grasses and woody vegetation are reestablished. The predominant vegetation communities that would be affected by construction disturbance are mesquite upland scrub steppe and mixed desert scrub steppe. They would be replaced by native grasses and herbaceous plants during initial reclamation and revegetation, which would attract big game species as well as many small game and nongame species that utilize grasslands and herbaceous feed and cover.

Terrestrial wildlife habitat would be affected by slightly increased habitat fragmentation caused by the installation of new roads. The construction of roads would dissect the landscape and may alter travel routes for game species. Big game would not be adversely affected by this fragmentation, primarily because the open areas between new roads would be located in areas where vegetation is open and similar on both sides of the roads that extends for long distances without creating edge effects.

Direct impacts to small game species (e.g., scaled quail, black-tailed jackrabbit, and desert cottontail) from road construction and habitat disruption caused by vehicle traffic may include nest or burrow abandonment or loss of eggs or young from the removal or crushing of natural habitat during construction. Wildlife movements within the project area would be modified by the construction and operation of project-related roads and buildings. Most of the impacts to wildlife habitat would occur at the Processing Plant Site, near the mine entrance, and at the Jal loadout because they would have the greatest amount of sustained human activity. The well field would have less frequent vehicle traffic and less habitat disruption.

Construction would result in the mortality of some less mobile or burrowing nongame species (e.g., small mammals, nesting birds, reptiles, amphibians, invertebrates) as a result of crushing from vehicles and construction equipment. Other impacts include the short-term displacement of the more mobile species (e.g., medium-sized mammals, adult birds) as a result of surface disturbance activities.

The habitats adjacent to the proposed disturbance areas may support some displaced animals, depending on current carrying capacity.

If surface-disturbing activities occur near nesting sites during the breeding season for passerines (approximately March 1 through August 31), impacts would result in nest or territory abandonment and possibly the loss of eggs or young resulting in the loss of productivity for that breeding season. For species protected under the MBTA, the loss of an active nest site, incubating adults, eggs, or young would be a violation of the MBTA. However, the extent of impacts to nesting birds would depend on the nest location relative to the actual locations of construction, the phase of the breeding period, and the level and duration of the disturbance.

Raptors that nest close to construction locations would be likely to abandon their breeding territory or nest site, or may experience the loss of eggs or young, as a result of surface disturbance activities during construction. These losses, if they were to occur, would reduce productivity for that breeding season. The degree of these impacts would depend on a number of variables including the location of the nest site, the species' relative sensitivity to disturbance, and the breeding cycle.

New and rerouted overhead power lines could pose an electrocution hazard for raptor species attempting to perch on the structures and would slightly increase collision potential for migrating and foraging birds. Collision potential typically is dependent on variables such as the location of the power lines in relation to high-use habitat areas (e.g., nesting, foraging, and roosting), line orientation to flight patterns, and movement corridors, visibility, and line design (APLIC 1994). The proposed new power lines would be located in or near areas with high levels of human activity (mine entrance and processing plant). Therefore, raptors may be deterred from the power lines due to human activity, which may minimize nesting and roosting.

Indirect impacts to terrestrial wildlife species would result from increased noise levels and human presence during construction. Big game (pronghorn and mule deer) would likely decrease their use of areas surrounding surface disturbance activities. However, this displacement would be short-term and animals would return to the adjacent areas following completion of construction activities. Indirect impacts would include the temporary displacement of small game from the construction areas as a result of increased noise and human activities. Displacement of small game from construction areas would be short-term and wildlife would return following construction activities where habitat remains available.

Potential impacts to game species from construction activities would be minimized through implementation of the applicant-committed and BLM environmental protection measures summarized in Section 2.4.7. Potential impacts to nongame species from construction activities would be minimized through implementation of the mitigation measures identified at the end of this section along with the implementation of the BLM Environmental Protection Measures (2.3.2, Surface Disturbance Buffer; 2.5.2.1, Raptor Protection; 2.11.1.1, Raptor Nests and Heronries; 2.11.2.1, Prairie Chickens; and 2.11.2.2, Sand Dune Lizards).

<u>Operations</u>

Direct impacts to many wildlife species from the operation and maintenance activities associated with the Proposed Action would include the incremental long-term habitat loss or alteration of potential breeding or foraging habitats until native vegetation has become reestablished.

The projected groundwater drawdown under the Proposed Action would not cause changes to the vegetation communities, surface water sources, or the associated wildlife habitat in the locations identified in Section 4.7, Vegetation. Therefore, there would be no impacts to wildlife from groundwater drawdown.

Due to the lack of water sources for wildlife in the area, the evaporation ponds proposed for the project may entice wildlife to use them as new watering sources, which would be detrimental. The potential exposure of small mammals to hypersaline water in the evaporation ponds may result in acute or chronic salt toxicity. Once the new evaporation ponds become fully operational, salt levels within the ponds would become much more concentrated than natural playa lakes in the region.

The ponds would be likely to attract a variety of migratory bird and bat species, causing disease or mortality unless deterrents are employed. Any MBTA species that land on the hypersaline evaporation ponds are likely to experience acute or chronic toxicity. Studies conducted on hypersaline playa lakes in southeastern New Mexico (Meteyer et al. 1997) during spring and fall migrations have shown that, “when birds remained on the lakes for prolonged periods of time, such as during stormy weather, a heavy layer of salt precipitated on their feathers. This precipitate was then ingested by the birds through frequent preening of salt-laden feathers,” causing sodium toxicity and often death. As little as 4 grams of salt can be lethal to birds (USFWS 2009). According to the USFWS (Hudson 2010), the hypersaline tailings pond associated with a potash mine in Eddy County, New Mexico, caused high mortality rates of migratory birds until hazing and other mitigation measures were employed.

Indirect impacts to wildlife species would result from the increase in habitat disruption from vehicle traffic and human presence during operations and maintenance activities. The most common wildlife responses to noise and human presence are avoidance or accommodation. Avoidance would result in displacement of animals from an area larger than the actual disturbance area. It is not possible to predict the total extent of habitat lost as a result of wildlife avoidance response, because the degree of this response varies from species to species and can vary between individuals of the same species. After initial avoidance of human activity and noise, certain wildlife species would acclimate to the activity and reoccupy areas formerly avoided. For example, during the initial development phases, it is likely that big game would be displaced from a larger area than the actual disturbance sites due to the avoidance response. Avoidance distances of 100 to 200 meters are common for some big game species (Lyon 1983). However, these big game species have demonstrated the ability to acclimate to infrequent vehicle traffic and a variety of mining activities as long as human harassment levels do not increase substantially. It is possible, therefore, that the extent of displacement would be limited to the actively used areas along roads, wells, and within the Processing Plant Site, after the first few years of project operations. As a result, impacts to wildlife species through habitat disruption associated with human presence and noise would be low.

4.8.5.2 Aquatic Species

The project region includes various wetlands, playas, salt ponds, and ephemeral streams. The only perennial stream is the Pecos River well to the west of the project area. Continued pumping of water from the Captain Aquifer may slightly decrease water flows to the Pecos River downstream of the project area. However, the reduction of instream river flows is not likely to affect aquatic species in the river.

4.8.5.3 Sensitive Species

The impact analysis for sensitive wildlife species and associated habitats focused on those species that were identified as potentially occurring within the project area (see **Table 3.8-1**). Impacts to species that could potentially be affected by implementation of the Proposed Action are presented below.

A total of 14 terrestrial species have been identified as potentially occurring within the project area. Without detailed occurrence data for each of these species within the project area, it is be concluded that potential impacts to sensitive wildlife species would be the same as those discussed for terrestrial wildlife in the construction and operations phases of the Proposed Action. No adverse effects to sensitive species are anticipated. Additionally, the implementation of the BLM Environmental Protection Measures (2.3.2, Surface Disturbance Buffer; 2.5.2.1, Raptor Protection; 2.11.1.1, Raptor Nests and Heronries; 2.11.2.1, Prairie Chickens; and 2.11.2.2, Sand Dune Lizards) and mitigation measures identified below in Section 4.8.10 would reduce potential impacts to sensitive wildlife resources. As a result, overall impacts to sensitive species are considered to be low.

No surface disturbance is allowed within 200 meters (656 feet) of lesser prairie-chicken leks. No known lek sites are located within the project area (see **Figure 3.8-2**). The proposed mine site lies within the area of BLM lesser prairie-chicken timing restrictions but project-related operations would be underground, so no impact to lesser prairie-chickens or populations would result. BLM Environmental Protection Measure 2.11.2.1 would limit the timing of construction (not allowed from March 1 through June 15). All other portions of the project area do not cross any leks or buffers so no BLM timing restriction would apply.

4.8.6 Alternative B

4.8.6.1 Terrestrial Wildlife

Impacts to terrestrial wildlife from the construction and operation of Alternative B would be similar to the impacts outlined for the Proposed Action within the project area. Additional impacts to wildlife species could occur from Alternative B because of the increased disturbance of native habitats should the footprint of the tailings stockpile be expanded to reduce the total height.

4.8.6.2 Aquatic Species

The impacts to aquatic species would be the same as those described for the Proposed Action.

4.8.6.3 Sensitive Species

In the project area, impacts to sensitive species from the construction and operation of Alternative B would be similar to the impacts outlined for the Proposed Action.

4.8.7 Alternative C

Impacts to terrestrial wildlife, aquatic species, and special status species from the construction and operation of the proposed project under Alternative C would be the same as impacts described for the Proposed Action.

4.8.8 Alternative D

The types of impacts to terrestrial wildlife, aquatic species, and sensitive species from the construction and operation of the proposed project under Alternative D would be similar to those described for the Proposed Action. Construction of Alternative D would affect one additional vegetation community, playa, that would not be affected under Alternatives A, B, and C. **Table 4.7-3** summarizes initial impacts to vegetation communities and habitat types under Alternative D. **Table 4.7-4** summarizes long-term impacts to vegetation communities and habitat types under Alternative D. Because the evaporation ponds would be constructed over most of the large playa and cover the two smaller playas in the proposed processing plant site, important habitat for amphibians, invertebrates, migratory waterfowl, and shorebirds would be removed, adversely affecting this habitat type that is relatively scarce in the region.

4.8.9 Preferred Alternative

Impacts to terrestrial wildlife, aquatic species, and sensitive species from proposed construction and operations would be the same as those described for the Proposed Action.

4.8.10 Mitigation Measures

To minimize potential adverse impacts to terrestrial wildlife and special status species, recommended additional mitigation measures include the following:

- Eight-foot-high fencing that follow fencing guidelines developed by NMDGF (2003) should be installed around the evaporation ponds at the base of the earthen berms to minimize access by terrestrial wildlife species. Chain-link fences intended to exclude large and medium size wildlife should be wrapped with a finer mesh material around the bottom to exclude smaller animals. Fences may need to be modified to reduce collisions if they are determined to be a hazard to lesser prairie-chickens.

- Perimeter and internal fencing intended solely to mark boundaries and discourage trespass should be constructed as directed by the NMDGF fencing guidelines (NMDGF 2003) to minimize potential injury to pronghorn and mule deer attempting to cross the fence.
- Posts associated with fencing or other project facilities should have solid tops to prevent entrance by wildlife species.
- Develop and implement an avian monitoring and mitigation plan designed to anticipate and prevent use of the ponds by waterfowl and any resulting risk of mortality. The plan may include bird deterrents to be installed at the evaporation ponds to minimize potential impacts to avian wildlife species (Murphy 2010). Potential deterrents include:
  - Mesh-net canopy over each pond to prevent access by birds.
  - Use trained dogs to harass birds from area.
  - Install a grid of gravel access roads to facilitate regular maintenance and hazing of birds.
  - Routine patrolling and firing shell crackers or other pyrotechnic devices.
  - Plant and manage tall, robust vegetation to discourage use by some waterbird species that typically occupy land near water.
  - Install commercially available bird hazing devices employing noise or radar.
  - Install wire lines over ponds with reflective tape or ribbon.
  - Monitoring of bird deterrents should be performed to evaluate their effectiveness and to allow for changes to measures through adaptive management should some mitigations prove unsuccessful.
- Avoid removing large trees, large mesquite, and large yuccas (if present) to protect potential nesting habitat or coordinate with the BLM to identify alternative protection measures.
- To minimize impacts to breeding migratory birds, clear vegetation in areas identified for disturbance outside of the typical nesting season (April - August).
- If restriction areas for lesser prairie-chickens are established in the project area, surface construction activities from March 1 and June 15 in established restriction areas will be avoided between the hours of 3:00 a.m. and 9:00 a.m. Noise will be limited to no more than 75 decibels measured at 30 feet from the source within an established restriction area.
- Follow trenching guidelines developed by NMDGF to minimize mortality to reptiles and small mammals during buried pipeline and utility installation.
- Conduct surveys for lesser prairie-chicken along proposed pipeline routes located near known habitat.
- Conduct surveys for burrowing owls following the NMDGF (2007) protocol prior to construction activities occurring from March to October within suitable habitat.
- Power lines should be constructed according to APLIC (2006) standards both onsite and offsite.
- At the end of the project, remove all caliche from access roads and revegetate except in shinnery oak dune habitat.

4.8.11 Summary of Impacts

Impacts to wildlife and sensitive wildlife species from the Proposed Action, Alternative B, Alternative C, Alternative D, and the Preferred Alternative are expected to have minimal adverse effects on species populations. Although impacts would be minimal, there would be effects that could be long-lasting to certain wildlife species, primarily small mammals, reptiles, and birds due to construction in their habitats and some habitat fragmentation.

Adverse impacts to wildlife and sensitive species that are common to all action alternatives include increased vehicle traffic, increased noise levels, and the installation of evaporation ponds that would attract terrestrial wildlife species, including big game and migratory birds, and potentially cause negative health effects. The implementation of the applicant-committed and BLM environmental protection measures, along with recommended mitigation measures, would minimize adverse impacts to wildlife and sensitive wildlife species to a point where impacts would not be significant.

4.8.12 Cumulative Impacts

Additional oil and gas development, with its associated new roads and other infrastructure, would be the primary contributor to wildlife habitat disruption and fragmentation in the region, in combination with the proposed Ochoa Mine Project. Because the projected future locations of development are unknown, the impacts on wildlife habitat or sensitive species cannot be quantified.

4.9 Rangelands and Livestock Grazing

4.9.1 Issues

The primary issues associated with range resources include direct and indirect impacts associated with the loss of forage, increased vehicle traffic, and potential impacts to seasonal livestock movement within grazing allotments.

4.9.2 Method of Analysis

Potential impacts to rangelands and livestock grazing resources were determined based on the locations of these resources in relation to the proposed surface disturbance areas. The locations of proposed surface disturbances, and potential subsidence areas were overlain on the grazing allotment and range improvement layers to determine the acreage lost of each grazing allotment, and which if any range improvements would be affected. The amount of acreage lost and the type of grazing allotment are evaluated to determine if there would be an effect to the grazing allotment lease or permit.

4.9.3 Assumptions

The following summarizes the impact analysis assumptions for rangelands and livestock grazing that would be affected by the proposed project. Impacts to rangelands and livestock grazing resources would be significant if the proposed project results in the permanent loss of AUMs that results in changes to the grazing allotment or an allotment becoming non-functional (i.e., no longer able to support livestock grazing).

The following assumptions were used in the analysis of impacts to rangeland and livestock grazing resources:

- An increase in the number of roads and vehicular traffic would contribute to difficulties for livestock management and increase the potential for livestock-vehicle collisions.
- The underground water pipeline would not severely restrict cattle access to grazing as the area would reclaimed once construction is complete.

- Surface disturbance and the long-term existence of mine related facilities would reduce the AUMs in grazing allotments.
- Applicant-committed measures, required lease stipulations, and BLM policy and guidelines (see Section 2.4.7) were taken into account in determining impacts.

4.9.4 Alternative A—Proposed Action

Under the No Action Alternative, the proposed project would not be approved. Grazing management would continue as currently authorized. No additional surface disturbance related to potash mining beyond those currently authorized would occur in the project area.

4.9.5 Proposed Action

Under the Proposed Action, impacts to range resources would result from surface-disturbing activities including the construction and operation of processing plant facilities, pipelines, and roads. **Table 4.9-1** identifies the acreage of initial disturbance per allotment, the number of livestock AUMs affected per allotment, and the percentage of AUMs that would be lost from surface-disturbing activities under the Proposed Action. The number of AUMs lost was calculated based on an average number of AUMs per acre for the grazing allotment acreage lost. Surface disturbance would be restricted to the processing plant facilities, water pipeline, railway loadout station access road. The mine is located underground, and the surface area associated with the underground mine would not be fenced. The Jal loadout, and the well field are not located in BLM grazing allotments.

Table 4.9-1 Impacts to Carrying Capacity by Allotment Due to Initial Disturbance under the Proposed Action

Disturbance Type	Grazing Allotment Name	Allotment Disturbance in Project Area (acres)	BLM Active AUMs Lost in Project Area (no.)	Percent Loss of Total Active AUMs
Jal Loadout Access Road	Jal Northwest	21	<1	1
Processing Plant Site and Water Pipeline	Red Tank II	1,880	308	89
Water Pipeline	Sand Dune	41	<1	<1
	Total	**1,942**	**310**	**90**

Initial disturbance associated with surface-disturbing activities would result in impacts to 1,942 acres on four BLM grazing allotments, resulting in the loss of 310 BLM AUMs over the life of the project. Permanent disturbance would result in the long-term loss of 1,325 acres and 218 AUMs in the project area. Jal Northwest, Red Tank II, and Sand Dune are Section 15 allotments, where grazing fees are charged as payment for forage consumed as measured by AUMs, instead of on an acreage basis as is done for the other grazing allotments. A reduction in AUMs available on the public lands would result in a decrease in the grazing fees associated with the grazing allotment lease. However, the loss of BLM AUMs would not affect the number of cattle the grazing allotment lessee could run on the private lands within the allotment. For Jal Northwest and Sand Dune, where the loss of AUMs would be minimal (1 percent and less than 1 percent, respectively), the fees associated with the lease most likely would not change. For the Red Tank II grazing allotment, the loss of AUMs most likely would result in a decrease in the fee charged for the grazing lease and an adjustment of the grazing lease.

Direct effects from construction and operation activities would result from surface-disturbing activities, and increased vehicle traffic. Surface-disturbing activities would result in the short-term loss of forage from facility construction, and long-term loss from the placement of permanent facilities associated with the plant facility, and Jal loadout access road. Indirect impacts would include the potential conversion of native vegetative communities due to impacts from increased erosion and invasion and spread of noxious and invasive weed species. Effects on rangelands and livestock grazing would be the same for either power supply option.

An increase in the traffic in the area could lead to a slight increase in mortality and injuries to livestock, and may cause disruptions to livestock management. Construction and operation activities may disrupt livestock management by limiting access to grazing areas and range improvements, and may restrict or alter livestock movements.

Within the plant facilities footprint are located a ranch water supply pipeline, two stock tanks, and a weaning trap. These rangeland improvements would be lost through the development of the processing plant facilities, specifically by the development of the tailings stockpile. The placement of the fence around the plant facilities site would replace the fence running north-west to south-east across the tailings stockpile that creates the weaning trap area. This would decrease the size of the weaning trap area for the Red Tank II grazing allotment.

Indirect impacts would include the potential spread of noxious and invasive species, fugitive dust, and the fragmentation of the Red Tank II grazing allotment. Following surface-disturbing activities, noxious weeds and invasive plant species may readily spread and colonize areas that typically lack or have minimal vegetation cover or areas that have been recently disturbed.

4.9.6 Alternative B

Under Alternative B, impacts to the project area would be the same as described for the Proposed Action, except that the volume or height of the dry stack tailings stockpile would be reduced by at least 30 percent. The modified stock pile footprint would not extend outside the processing plant facilities footprint.

4.9.7 Alternative C

Under Alternative C, impacts would be the same as under the Proposed Action, except that standards for managing co-development of minerals while allowing the BLM to approve the MPO, grant ROW requests, and issue preference rights leases for mining.

4.9.8 Alternative D

Under Alternative D, project-related surface disturbance activities would be similar to the Proposed Action. **Table 4.9-2** identifies the acreage of initial disturbance per allotment, the number of livestock AUMs affected per allotment, and the percentage of AUMs that would be lost from surface-disturbing activities under the Proposed Action.

Under the Alternative D, rangeland improvements would be lost through the development of the processing plant facilities. Construction of the ponds would require the removal of two windmills on private and state land and changes in a portion of range fence on private, public, and state land. Because the processing plant site would be fenced, grazing would not be allowed within the boundary, causing a loss of access to grazing mostly on state and private land, but also affecting some public land. Within the proposed processing plant site is an established BLM study plot that has been used for monitoring rangeland condition over many years. While the rangeland study plot may not be affected by surface disturbance because it is outside the pond construction area, it would be inaccessible to grazing, which would limit its effectiveness as a range study plot.

Table 4.9-2 Impacts to Carrying Capacity by Allotment Due to Initial Disturbance under Alternative D

Disturbance Type	Grazing Allotment Name	Allotment Disturbance in Project Area (acres)	BLM Active AUMs Lost in Project Area (no.)	Percent Loss of Total Active AUMs
Jal Loadout Access Road	Jal Northwest	21	<1	1
Processing Plant Site and Water Pipeline	Red Tank II	1,877	308	89
Water Pipeline	Sand Dune	44	1	<1
	Total	**1,942**	**310**	**90**

4.9.9 Preferred Alternative

Under the Preferred Alternative, impacts to the project area would be the same as described for the Proposed Action, except that the footprint of the dry stack tailings stockpile may be reduced, which would slightly decrease the acreage of land unavailable for grazing once the project is completed.

4.9.10 Mitigation Measures

Impacts to grazing allotments would be minimized through the implementation of the applicant-committed environmental protection measures outlined in Section 2.4.7.3, BLM Carlsbad Field Office Requirements (Section 2.4.7.4 and **Appendix A**), and environmental protection measures required by federal and state permits, policy, and guidelines summarized in Sections 2.4.7.1 and 2.4.7.2. During construction, these measures would minimize surface impacts, soil erosion, and the potential for the establishment of noxious weeds and invasive species. Cattle guards will be installed on paved and other access roads, where necessary. Restrictions to livestock movement would be minimized by the burying of the water pipeline, and the lack of fencing around the underground mine area.

Areas not needed for operations would be reclaimed as soon as construction activities are complete. Final reclamation would occur at the end of the life of the project. All structures and infrastructure would be removed, and disturbed areas would be revegetated. Re-establishment of herbaceous species would take 3 to 5 years, while tree and shrub species could take 20 to 50 years. Once successful reclamation has been achieved in these areas, livestock grazing could be resumed.

Recommended additional mitigation measures include the following:

- Speed limits should be followed and signs would be erected to warn vehicle operators of construction and project-related traffic.
- The plant facilities west fence along Sections 26 and 35, would be tied into the fenceline for the weaning trap associated with the Red Tank II grazing allotment.
- The range improvements located in the Red Tank II grazing allotment in Section 2, T24S, R33E would be relocated to an alternate location outside of the plant facilities area that would be approved by the surface owner.
- The range study plot located within the boundary of the processing plant site under Alternative D should be relocated to an area of active grazing on public land outside of the boundary.

- Prior to construction of plant facilities, access roads, mine shaft, and the water pipeline, surveys would be conducted to identify active range improvements, including livestock and wildlife water sources/systems, in coordination with the BLM and the livestock operators. Based on the results of these surveys, surface disturbance would be placed within 200 meters of range improvements, including livestock and wildlife water sources/systems. If avoidance is not feasible, features would be relocated to an alternate location. Alternate locations would be approved by the BLM on BLM lands, and by the surface manager on all other lands.

4.9.11 Summary of Impacts

The primary impacts to rangelands and livestock grazing would be reductions in forage and changes to livestock movements specifically on the Red Tank II allotment. The reductions in forage would result in the reduction of forage and the associated AUMs and possibly the grazing allotment lease fees for the Red Tank II grazing allotment. Impacts to rangelands and livestock grazing would be the same under Alternatives A (Proposed Action), C, and the Preferred Alternative, and may be slightly more under Alternative B, depending on the tailings stockpile configuration. Under Alternative D, there would be increased adverse impacts to rangelands and livestock grazing due to the location of the processing plant site on a playa. Implementation of Alternative D also would result in the loss of two windmills, a portion of range fence, and a BLM range study plot. No alternative would result in significant impacts to rangelands or livestock grazing.

4.9.12 Cumulative Impacts

Additional oil and gas development with construction of well pads, roads, and ancillary facilities would add to the total acreage of vegetation disturbed in the vicinity of the project area. Other construction and vegetation management activities would affect the extent and type of forage in grazing allotments in the vicinity of the project area, but the locations of these future activities are not known well enough to quantify the cumulative impacts.

4.10 Lands and Realty

4.10.1 Issues

Land use issues associated with the proposed project include:

- Surface disturbance and visual resource alterations that are inconsistent with land use plans.
- Increased traffic on NM 128 as well as on local roads.

4.10.2 Method of Analysis

Analysis of impacts to lands and realty was completed primarily using a qualitative evaluation of how the proposed project would affect current land uses and transportation in the project area and the region.

4.10.3 Assumptions

Assumptions for analysis are as follows:

- Project-related vehicle traffic would temporarily affect public traffic on NM 128 and local roads within the project area.
- New ROWs may limit the locations of future land use changes.

4.10.4 No Action Alternative

Under the No Action Alternative, mining activities would not take place within the project area so there would be no change to lands, realty, and transportation activities beyond the currently authorized activities.

4.10.5 Alternative A—Proposed Action

The proposed project and alternatives would affect lands managed by the BLM, the State of New Mexico, and private landowners. Land ownership in relation to proposed project facilities is displayed on **Figure 2-1**. New ROW authorizations would be required where roads, the new power line, pipelines, and other infrastructure would be located on BLM or State of New Mexico lands. The establishment of these new ROWs may limit other future land uses that require facilities in the project area for the life of the mining project (50 years). ICP has obtained commitments to provide easements for the proposed new water pipeline where it crosses private land or follows the NM 128 ROW.

As part of the RMP revision process currently underway, the BLM Carlsbad Field Office is considering identifying the public land encompassed by the proposed processing plant site as available for disposal. Should this area be identified as a disposal parcel in the Final RMP, a land exchange or sale of this parcel could be considered under a separate NEPA process to be conducted as part of the BLM land tenure adjustment process in compliance with the FLPMA and other BLM policies, regulations, and guidance that pertain to land sales and exchanges. Transfer of the processing plant site to ICP would alleviate concerns and potential liability related to the long-term maintenance of the tailings stockpile following reclamation.

Other uses common in the area that could be affected include cattle grazing and oil and gas development. Long-term disturbance would equal approximately 1,362 acres, the majority of which would be the processing plant site. This long-term disturbance area would displace existing surface land uses, such as cattle grazing. Local landowners also may have cattle facilities and access impacted as well. ICP would work with local landowners to ensure that impacts to cattle facilities and access to ranching operations would be minimized. The proposed project also would operate concurrently with existing oil and gas wells. An extraction rate of 90 percent would be utilized for most of the mine, with a reduced extraction rate of 60 percent near active oil or gas wells. ICP would seek a framework that would ensure that potash mining can proceed in a way that does not interfere with fluid mineral extraction and both activities would not create a safety or environmental hazard. ICP also would hold annual meetings with oil and gas companies who have leases within the mining area and would prepare long-term development plans for the mine and oil and gas development (see Section 2.4.2.19).

Heavy equipment would be mobilized and moved into and out of the project area, depending on specific activities, during the 20-month construction period. During some construction activities, there would be frequent traffic on NM 128 and local roads by such vehicles as concrete trucks and service trucks, in addition to the daily travel by construction workers. While the greatest impact to transportation would be increased traffic and the use of new and existing roads during construction, the current traffic to, from, and within the project area is relatively light and is anticipated to be well within the capacity of the existing roads.

During project operations, trucks would transport the finished product to a loadout facility at Jal to be shipped via rail. The route to the Jal loadout facility is approximately 33 miles and would consist of NM 128 and an access road to be improved by ICP. Use of this access road would avoid project traffic traveling NM 18 through Jal. It is predicted that project traffic associated with the movement of product to the Jal loadout facility would consist of seven 24-ton trucks making 192 round trips per day, 365 days a year. This increase in operations traffic would elevate the annual average daily traffic values to approximately 1,600 vehicles, a 14 percent increase over 2012 levels, but a 17 percent decrease from 2010 levels (Valencia 2013). The 192 daily round trips would be conducted on a 24-hour basis, resulting in approximately 8 round trips an hour (ICP 2011). There also would be daily travel by the employees (465) to the plant facilities and mine area. It is assumed 35 percent of the operation work force would commute from Carlsbad, 30 percent from Hobbs, 20 percent from Eunice, 10 percent from Jal, and 5 percent would be unknown. The work force would utilize NM 128 east and west of the project area, as well as the local road network such as Delaware Basin Road. It is anticipated that some employees may choose to carpool reducing the amount of vehicle trips. The modest increase in traffic relative to recent traffic data would not significantly affect normal traffic levels, resulting in little impact to transportation resources. There would be a slight increase in the number of employees under the Onsite Power Supply Option, compared to the Offsite Power Supply Option, resulting in a minor but negligible increase in employee traffic.

4.10.6 Alternative B

Under Alternative B, there would be no change to the mining methods, operations, processing methods and management of co-development compared to the Proposed Action. This alternative would reduce the volume or height of the tailings stockpile to minimize the visual impacts. Under Alternative B, impacts to lands and realty would be similar to that described for the Proposed Action.

4.10.7 Alternative C

Under Alternative C, there would be no change to the mining methods, operations, and processing methods and buildings compared to the Proposed Action. This alternative would establish standards for managing co-development of minerals by a collaborative relationship where the BLM would work with the State of New Mexico. Under Alternative C, impacts to lands and realty would be similar to that described for the Proposed Action.

4.10.8 Alternative D

Under Alternative D, there would be no change to the mining methods, operations, processing methods, and management of co-development compared to the Proposed Action. This alternative would result in slight changes to the locations of proposed land use at the processing plant site compared to the Proposed Action, It also would require different arrangements for leasing or purchase of the land to be used for the processing facilities. Because the location of the evaporation ponds and tailings stockpile would involve additional private, state, and public lands, additional negotiations for lease or purchase would be required, Under Alternative D, impacts to lands and realty for all other areas (mine, well field, loadout) would be similar to that described for the Proposed Action.

4.10.9 Preferred Alternative

Under the Preferred Alternative, impacts to lands and realty would be similar to that described for the Proposed Action.

4.10.10 Mitigation Measures

Additional mitigation measures are not needed.

4.10.11 Summary of Impacts

Impacts would be similar across all action alternatives. There would be an increase in traffic levels on NM 128 between the processing plant and the Jal loadout and land use changes to accommodate the new processing plant.

4.10.12 Cumulative Impacts

Additional oil and gas development with construction of well pads, roads, and ancillary facilities may open up access to the public where none previously existed and may affect existing and future land uses. However, because the predominant land uses in the area are mining, fluid mineral extraction, and grazing, cumulative impacts to land use and realty are expected to be minimal because the current land uses would continue. Activities such as grazing, if displaced, would likely move to a nearby location.

4.11 Recreation

Primary recreational activities in this area are associated with hunting, hiking, and OHV use. There would be no developed recreation areas within or near the project boundary.

4.11.1 Issues

Recreation issues associated with the proposed project include:

- Reduction in access to dispersed recreation activities such as hunting, biking, camping, off-highway driving, and special events on public lands.
- The pipeline ROW and access roads may become unauthorized OHV routes.
- Reduction in recreational use of the area and tourism due to project-related traffic.

4.11.2 Method of Analysis

A qualitative analysis was performed based on existing recreational activities and possible effects the proposed project would have on the recreational experience.

4.11.3 Assumptions

Assumptions for analysis are as follows:

- Increased traffic would affect recreational opportunities and quality, including OHV use and hunting.
- Impact analysis must be qualitative due to the lack of accurate recreation use numbers for the project area.

4.11.4 No Action Alternative

Under the No Action Alternative, project mining activities and the associated new facilities would not be developed within the project area. There would be no project related impacts to recreation.

4.11.5 Alternative A—Proposed Action

Surface disturbance generated by construction would potentially affect recreation activities such as dispersed camping and hunting for big game, deer, dove, quail, and varmints. Construction activities would generate increased noise and traffic primarily during the day, which may temporarily diminish camping and hunting activities. The presence of new structures and operations would potentially diminish the hunting experience by displacing habitat as well as increasing noise and human presence. There are no designated recreation areas and, with the majority of the land in the project area being private or state land, and large areas of public land that would be unaffected by the project, impacts to recreation would be minor.

Increased project-related traffic on both access roads and BLM roads may tend to reduce tourism and recreational uses in the area. This impact is likely to be minor due to the users being accustomed to existing mineral development and operations within the project area.

4.11.6 Alternative B

There would be no difference in recreation impacts under this alternative as compared to the Proposed Action.

4.11.7 Alternative C

There would be no difference in recreation impacts under this alternative as compared to the Proposed Action.

4.11.8 Alternative D

There would be no difference in recreation impacts under this alternative as compared to the Proposed Action.

4.11.9 Preferred Alternative

There would be no difference in recreation impacts under this alternative as compared to the Proposed Action.

4.11.10 Mitigation Measures

No mitigation measures have been proposed for this resource.

4.11.11 Summary of Impacts

Under all alternatives except No Action, there would be an increase in vehicle traffic, OHV safety concerns, and an increased potential for unauthorized OHV use along new access roads. These impacts would be minor because recreation use is not heavy in the project area would decrease by the end of the proposed project, as facilities are decommissioned, traffic decreases, and portions of the project area are reclaimed.

4.11.12 Cumulative Impacts

Adverse cumulative impacts to recreational resources from additional oil and gas development would include increased noise and activity, and a reduction in dispersed camping opportunities. The increase in human activities from mineral development and motorized vehicle use is likely to have a long-term impact on recreational users such as hunters and hikers who tend to avoid areas that have been heavily developed. While a substantial area would be affected by industrial activities from the proposed project in combination with other RFFAs, there would be minimal overall impact to recreational activities.

4.12 Visual Resources

4.12.1 Issues

- Changes in the landscape due to new plant facilities and dry stack tailings pile.
- Consider impacts to foreground, middle ground, and background at key observation points (KOPs).
- Consider whether changes in scenery would impact the overall recreation experience by visually altering the natural environment.

4.12.2 Methods of Analysis

The VRI rated the project area by analyzing the relative worth of the affected landscape from a visual perception point of view at KOPs. KOPs are determined based on critical viewpoints, typically along well-traveled routes and near sensitive receptors such as residences. The KOPs identified for the project area, shown in **Figure 4.12-1**, include one location near an adjacent residence looking east toward the dry stack tailings stockpile (KOP 1) and three locations along NM 128 (KOPs 2, 3, and 4)

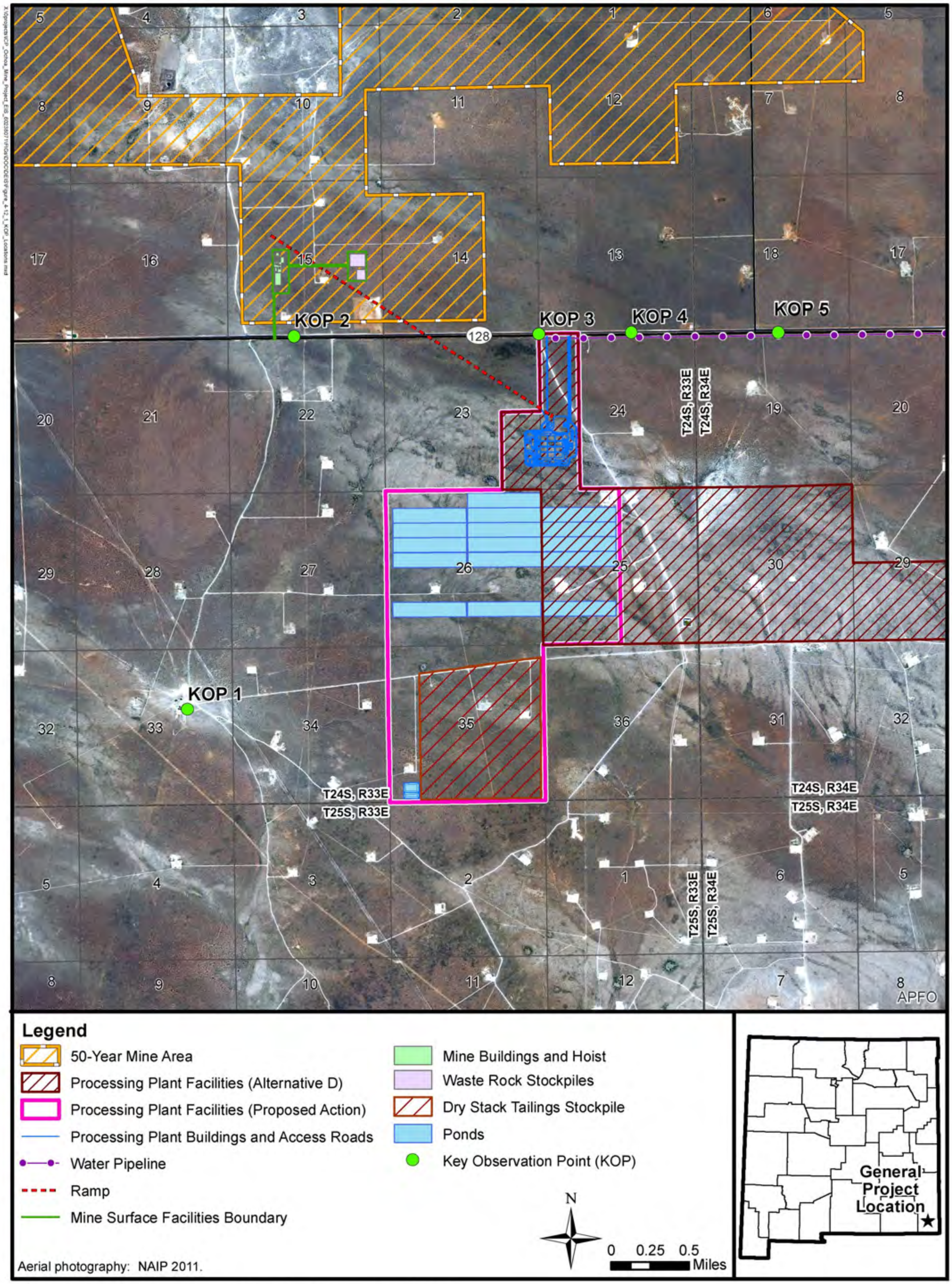


Figure 4.12-1 Locations of Key Observation Points

looking southeast, south, and southwest toward the project facilities and dry stack tailings stockpile. KOP 1 was selected to evaluate the potential for visual impacts to adjacent landowners. KOPs 2, 3, and 4 were selected to evaluate the potential for visual impacts associated with a large number of viewers from NM 128, the major highway in the project area. Key factors considered in the analysis were landform, vegetation, color, influence of adjacent scenery, scarcity of similar landscapes, and cultural modifications using the criteria for rating the degree of contrast between the existing landscape and the modified landscape. The results of this VRI were used to determine if the proposed project meets the BLM's visual resource management goals.

Visual simulations generated by computer were used to display the potential visual impact of tall proposed project facilities at each KOP.

4.12.3 Assumptions

Assumptions for analysis are as follows:

- Any surface facility would potentially alter the viewshed. The degree of change would be based on line, form, color, and texture of the facility.
- Changes to the visual landscape would meet VRM Class IV objectives, which allows for modification of the viewshed.
- Impacts to visual resources would be minimized through implementation of the relevant BLM environmental protection measures.

4.12.4 No Action Alternative

Under the No Action Alternative, mining activities and the associated new facilities would not be developed within the project area, and the viewshed would remain consistent with current land uses in the landscape.

4.12.5 Alternative A—Proposed Action

Impacts to the visual landscape from implementation of the Proposed Action would result in moderate to major modifications of the viewshed, primarily due to the addition of evaporation ponds, roads, processing facilities, and the dry stack tailings stockpile. The proposed processing facilities and tailings stockpile would be highly visible from NM 128 as well as from adjacent land. Although the project area has already been modified by existing oil and gas operations, the tailings stockpile would cover approximately 425 acres and rise to a maximum height of 200 feet at the end of 50 years. The tallest buildings at the plant site would include 6 to 8 rectangular buildings approximately 120 feet tall, stack heights for two dryers approximately 150 feet tall, and a stack associated with the cogeneration facility approximately 165 feet tall. These project components would surpass the height of any manmade or natural feature within or near the project area, creating a visual landmark.

A visual resources inventory (VRI) of the plant facilities was conducted by the BLM in January 2012. Visual Resource Contrast Rating Worksheets were completed for each KOP to assess the degree of contrast between the existing landscape and the landscape modified by the proposed project. The analysis included a comparison of three basic features (landform, vegetation, and structures) and the basic elements (form, line, color, and texture) of the existing landscape and the modified landscape. The degree of contrast is determined by rating the elements of the existing landscape with the modified landscape according to criteria described in **Table 4.12-1**.

Table 4.12-1 Criteria for Visual Resources, Degrees of Contrast

Degree of Contrast	Criteria
None	The element contrast is not visible or perceived.
Weak	The element contrast can be seen but does not attract attention.
Moderate	The element contrast begins to attract attention and begins to dominate the characteristic landscape.
Strong	The element contrast demands attention, will not be overlooked, and is dominant in the landscape

Source: BLM 1986

Contrast ratings for KOP 1 indicate that the degree of visual contrast to an adjacent residence to the west resulting from the dry stack tailings stockpile would be rated as “strong” in the elements of form, line, and color. The degree of contrast from the element of texture would be “moderate.” From KOP 1 visual modifications from the tailings stockpile would dominate the landscape and would not be overlooked. There is no contrast rating resulting from vegetation changes because the changes in vegetation would not be apparent from that location due to the slope of the ground. Visual contrasts from project facilities would be rated “moderate” in the elements of color and texture, and “strong” in the elements of form and line. From KOP 1, form and line elements from project facilities would dominate the landscape. Color and texture elements would not dominate the landscape, but would attract attention and begin to dominate the landscape, even after the tailings stockpile was revegetated at the end of the project. This KOP is approximately 1.5 miles west of the western-most edge of the dry stack tailings stockpile. As is depicted in **Figure 4.12-2**, the level of visual contrast from the proposed tailings stockpile relative to the existing visual setting would result in a dramatic change in landscape by the end of the project. The tailings stockpile as depicted is shown before revegetation is implemented.

Contrast ratings for KOPs 2, 3, and 4 along NM 128 indicate that the degree of visual contrast evident to traffic on the highway would be rated as “strong” in the elements of form, line, and color. The degree of contrast from the element of texture would be rated as “moderate.” From these KOPs, visual modifications from the proposed buildings, stacks, and dry stack tailings stockpile to vehicles utilizing NM 128 would dominate the landscape and would not be overlooked. The ponds would not be visible from the road due to the terrain and placement behind the tall structures. Visual contrasts from vegetation would be rated as “moderate” in the elements of form, color, and texture due to the vantage point that is higher than the plant site, and “strong” in the element of line due to the angular lines created by the buildings and tailings stockpile. From these KOPs the line element from vegetation would dominate the landscape. The elements of form, color, and texture would not dominate the landscape, but would attract attention and begin to dominate the landscape. Visual contrasts from processing facilities would be rated “moderate” in the element of texture, and “strong” in the elements of form, line, and color. From KOP #1, form, line, and color elements from project facilities would dominate the landscape. The element of texture would not dominate the landscape, but would attract attention and begin to dominate the landscape. As is depicted in **Figures 4.12-3** through **4.12-5**, the level of visual contrast from the proposed project structures relative to the existing visual setting would result in a dramatic change in landscape visible to a large numbers of viewers from NM 128.

On the north side of NM 128, the structures at the mine opening (buildings, hoist, and roads) and the two waste rock piles would be visible from the road. While these would be a change from the natural landscape, they would not be as dominant as the structures and forms on the south side of the road.

The Jal loadout would add buildings and roads to the landscape, but they would be similar to the other lines and forms in Jal and along the railroad so they would blend in to the already modified landscape.

Long-term visible impacts would be caused by alteration of the landscape by man-made features that would add to the number of lines present in the landscape, mainly the dry stack tailings stockpile, the tall processing facilities, and the cogeneration stack. Even after reclamation is completed by demolition of cogeneration and processing plant buildings, regrading, and revegetation, the tailings stockpile would create a permanent change to the landscape. The results of the VRI indicate that the project design would meet visual resource Class IV management objectives, which allow for major modification of the natural landscape and allow human structures to dominate.

4.12.6 Alternative B

Under Alternative B, impacts to visual resources in the project area would be similar to that described for the Proposed Action. If the height of the dry stack tailings stockpile were lower, it would be less dominant in the view from all KOPs although it would still be highly visible from KOP 1, as shown in **Figures 4.12-6** through **4.12-9**.

Should the more natural configuration of the tailings stockpile be selected, it would result in less angular lines but it would still be visible from all KOPs. Examples of a possible natural tailings stockpile configuration are shown in **Figures 4.12-10** through **4.12-13**. Note that this configuration would take up much more space and cause more surface disturbance, extending beyond the boundaries of the proposed processing plant site. Many more possible configurations are possible that would meet the need for a more natural configuration, so the one shown in these figures is displayed only for comparison to the other options.

Under Alternative B, there would be slightly fewer visual impacts from changes to the tailings stockpile than under the Proposed Action. All other visual impacts would be the same as those described for the Proposed Action.

4.12.7 Alternative C

Under Alternative C, impacts would be the same as that described for the Proposed Action.

4.12.8 Alternative D

Under Alternative D, impacts to visual resources in the mine area, well field, and Jal loadout would be similar to that described for the Proposed Action. The dry stack tailings stockpile would be highly visible from KOPs along NM 128 to passersby (see **Figure 4.12-14**) and less visible from KOP 1 (see **Figure 4.12-15**).

Under Alternative D, there would be slightly fewer visual impacts to sensitive lessee’s from changes to the tailings stockpile location than under the Proposed Action, but increased visual impacts from NM 128. All other visual impacts would be the same as those described for the Proposed Action.

4.12.9 Preferred Alternative

Under the Preferred Alternative, impacts to visual resources in the project area would be similar to that described for the Proposed Action. If the height of the dry stack tailings stockpile were lower, it would be less dominant in the view from all KOPs, as described under Alternative B.

4.12.10 Mitigation Measures

Recommendations from the VRI analysis include painting the proposed new buildings to blend with the environment using colors that comply with BLM standards.

4.12.11 Summary of Impacts

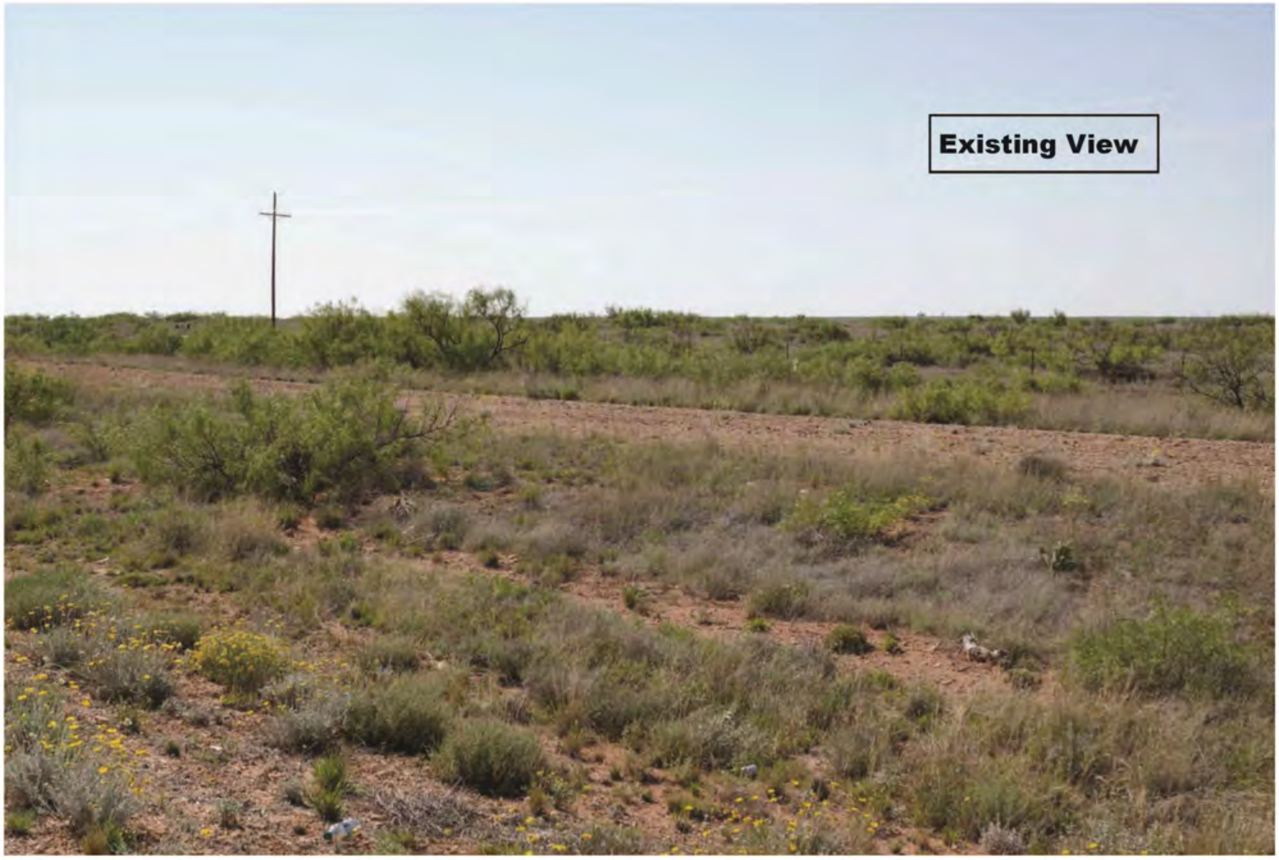
Under all action alternatives, the visible impacts would be mainly from alteration of the landscape by man-made features creating lines not previously present in the landscape. The most prominent changes to the landscape would occur at the processing plant site from the tall buildings, stacks, and tailings stockpile. Visible under all but the No Action Alternative, but of less concern, would be the structures, roads, and waste rock piles near the mine opening.

With the exception of the evaporation ponds and the tailings pile, similar man-made and industrial features currently exist in the project area. ICP would comply with BLM visual resource management requirements to minimize impacts. Although the buildings and tailings pile are expected to be landmarks within the viewshed, impacts are not expected to be incompatible with current BLM VRM objectives.

4.12.12 Cumulative Impacts

Infrastructure from existing and future oil and gas development in the vicinity of the project area would add to the visual impacts from man-made structures on the landscape. As this region is already considered to be modified by man-made structures, additional structures, roads, and surface disturbance, additional visual modifications would be similar to those already existing, except for the dry stack tailings stockpile that would be a larger modification over the long term.

Figure 4.12-2 Existing and Proposed View of Processing Plant Site from KOP 1 Under The Proposed Action



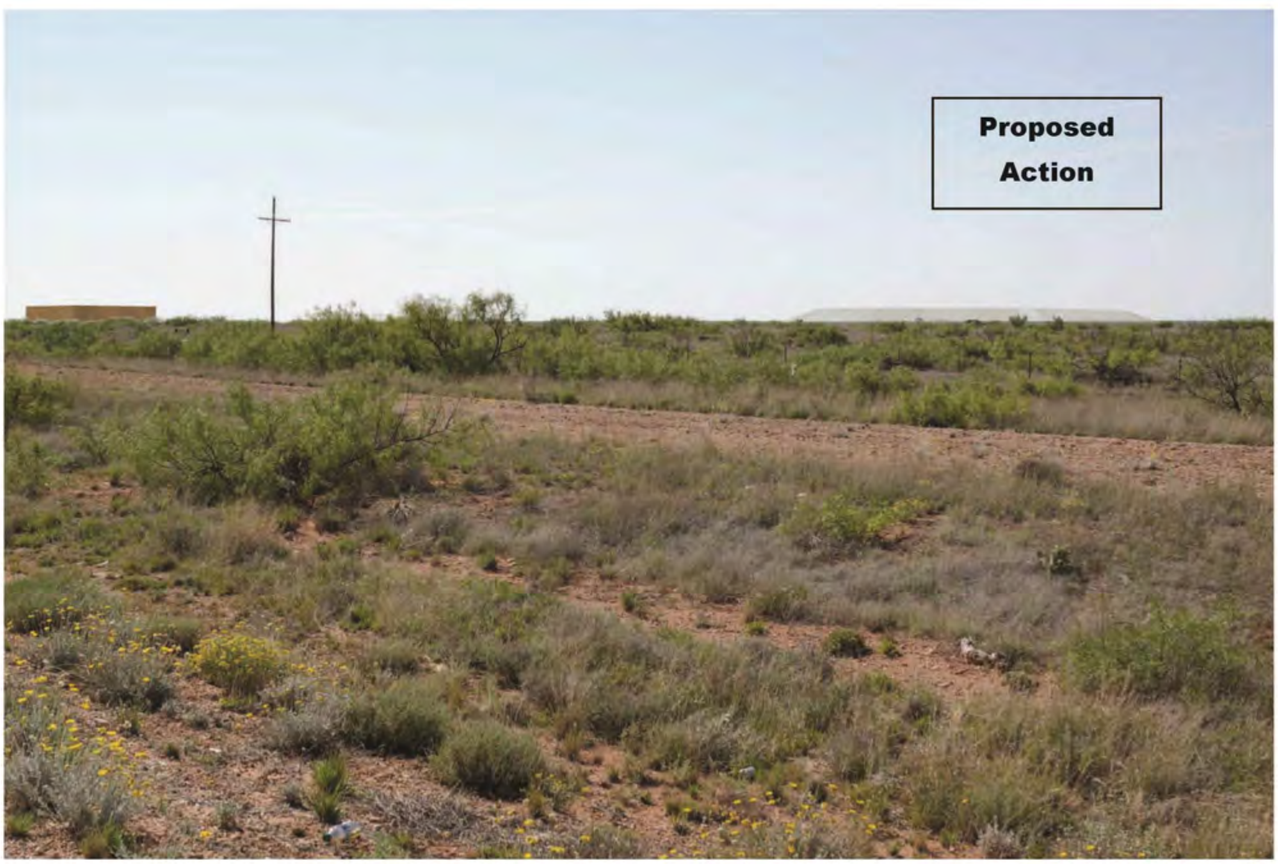


Figure 4.12-3 Existing and Proposed View of Processing Plant Site from KOP 2 Under The Proposed Action

Figure 4.12-4 Existing and Proposed View of Processing Plant Site from KOP 3 Under The Proposed Action

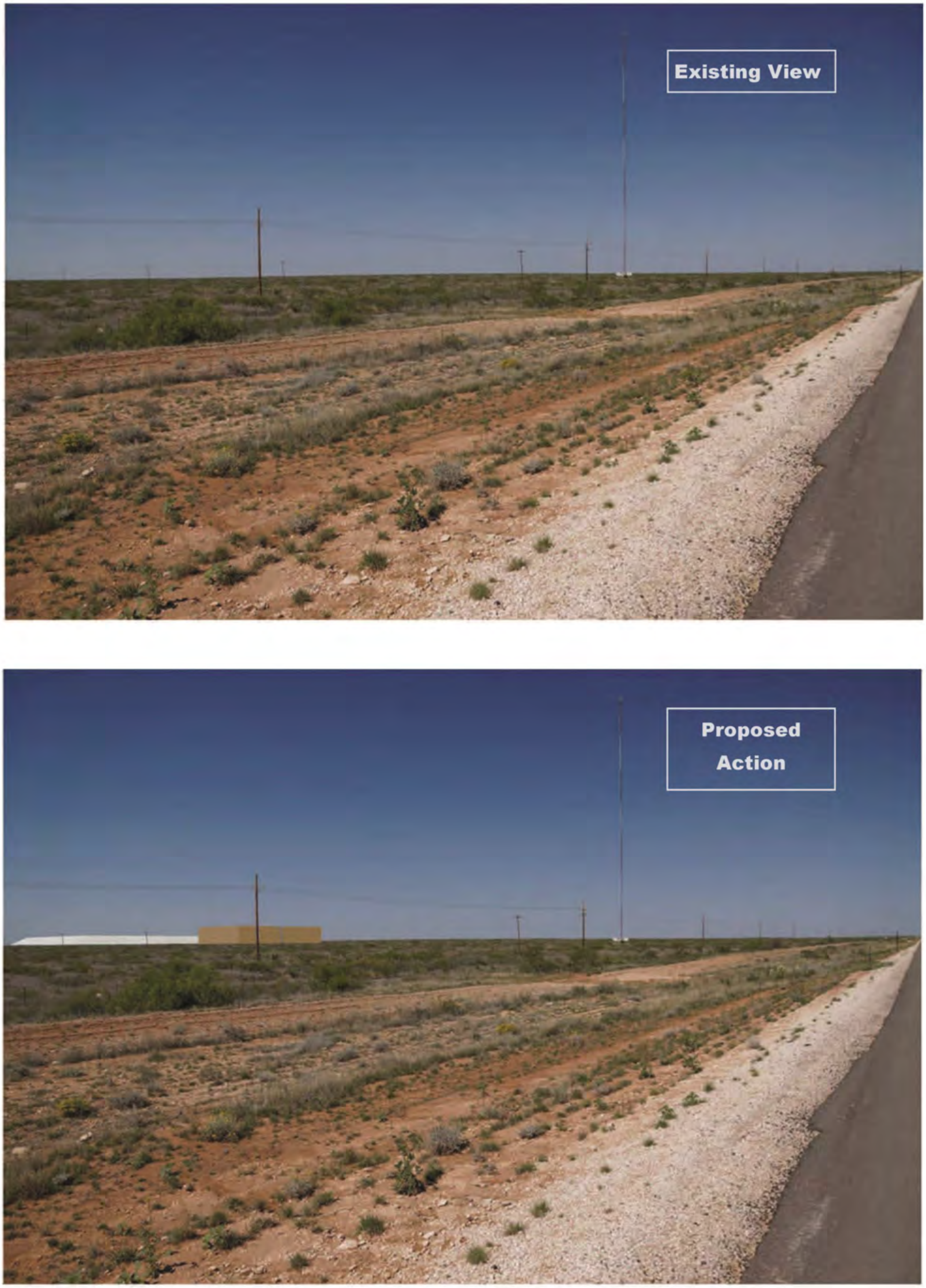


Figure 4.12-5 Existing and Proposed View of Processing Plant Site from KOP 4 Under The Proposed Action

Figure 4.12-6 Existing and Proposed View of Processing Plant Site from KOP 1 Under Alternative B—Lower Tailings Stockpile

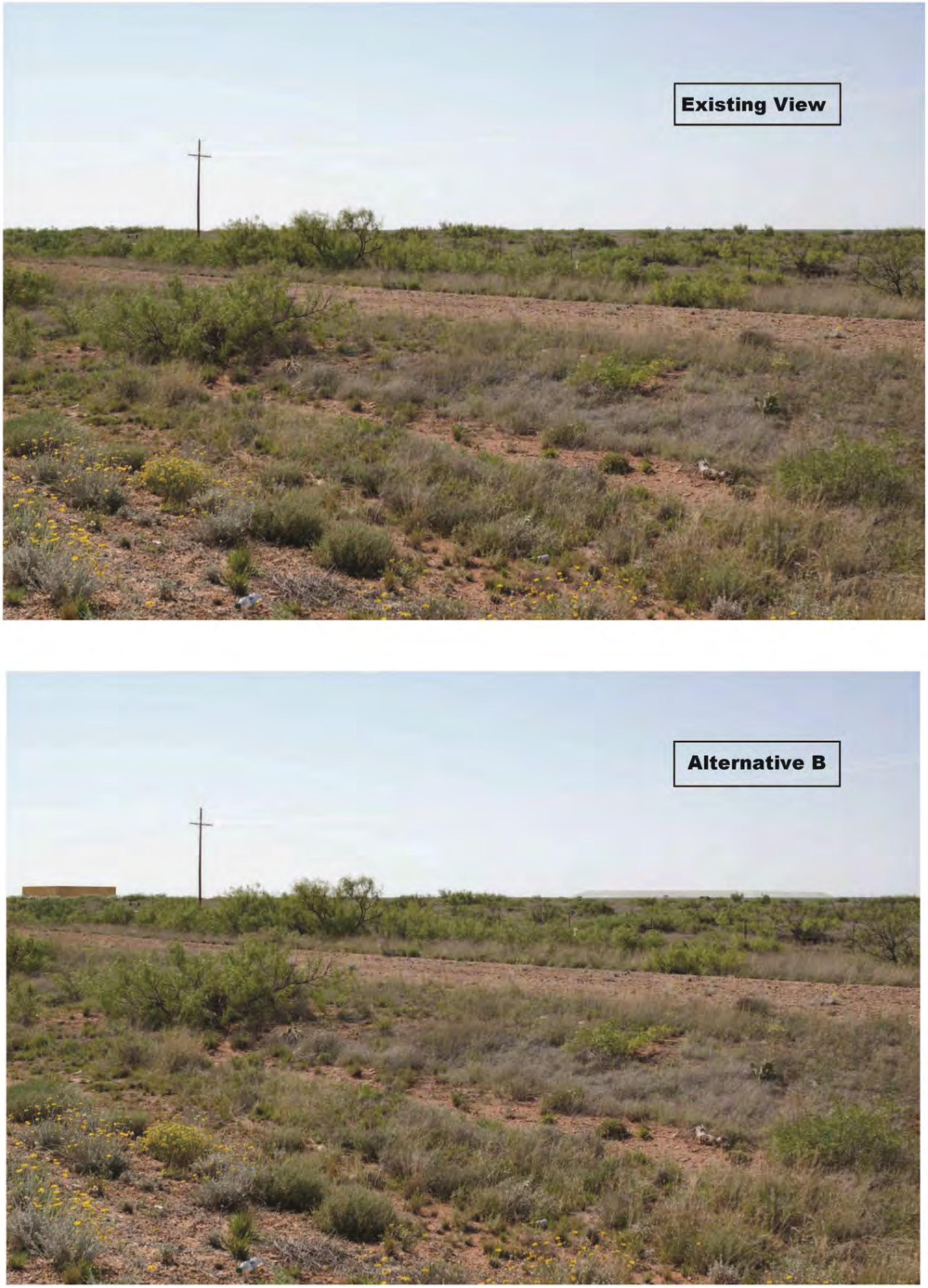
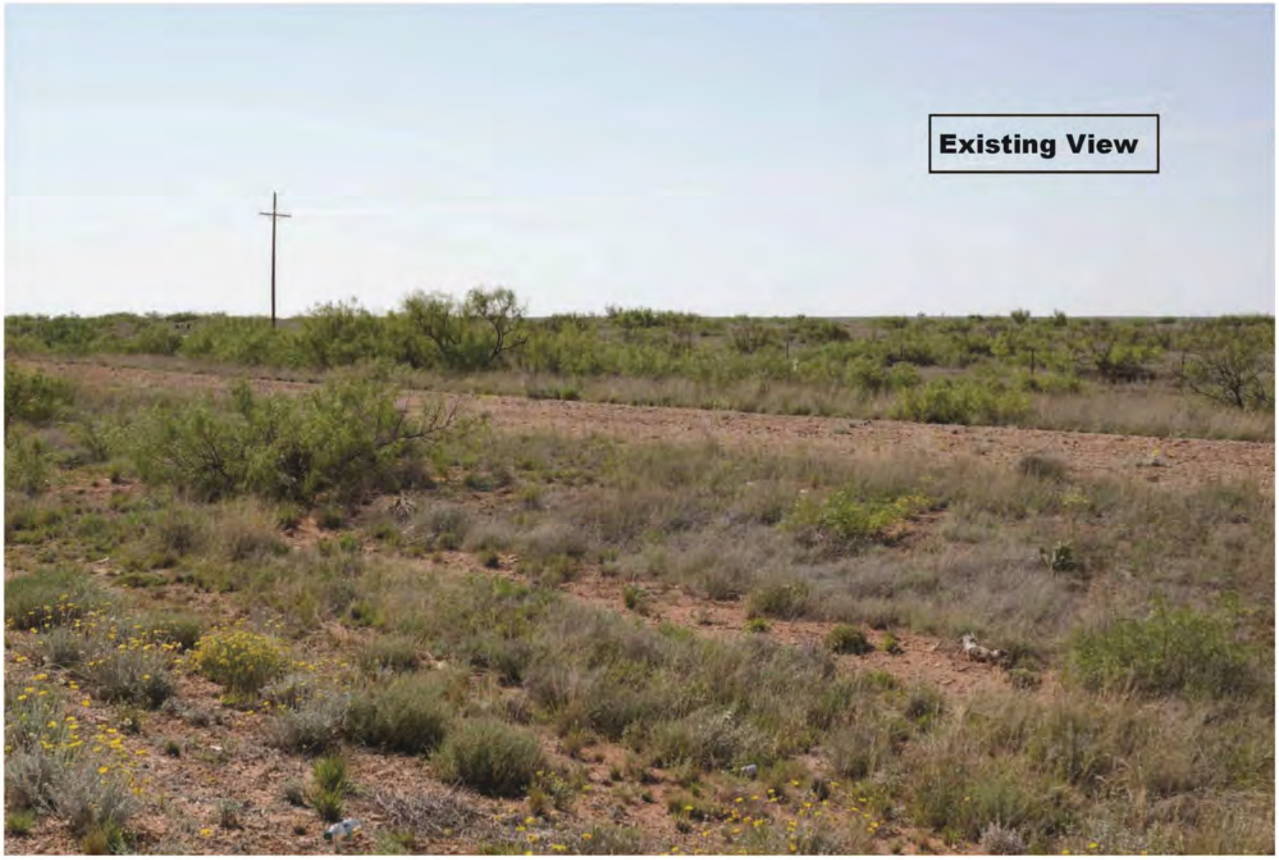


Figure 4.12-7 Existing and Proposed View of Processing Plant Site from KOP 2 Under Alternative B—Lower Tailings Stockpile

Figure 4.12-8 Existing and Proposed View of Processing Plant Site from KOP 3 Under The Alternative B—Lower Tailings Stockpile

Figure 4.12-9 Existing and Proposed View of Processing Plant Site from KOP 4 Under Alternative B—Lower Tailings Stockpile

Figure 4.12-10 Existing and Proposed View of Processing Plant Site from KOP 1 Under Alternative B—Natural Shape Tailings Stockpile



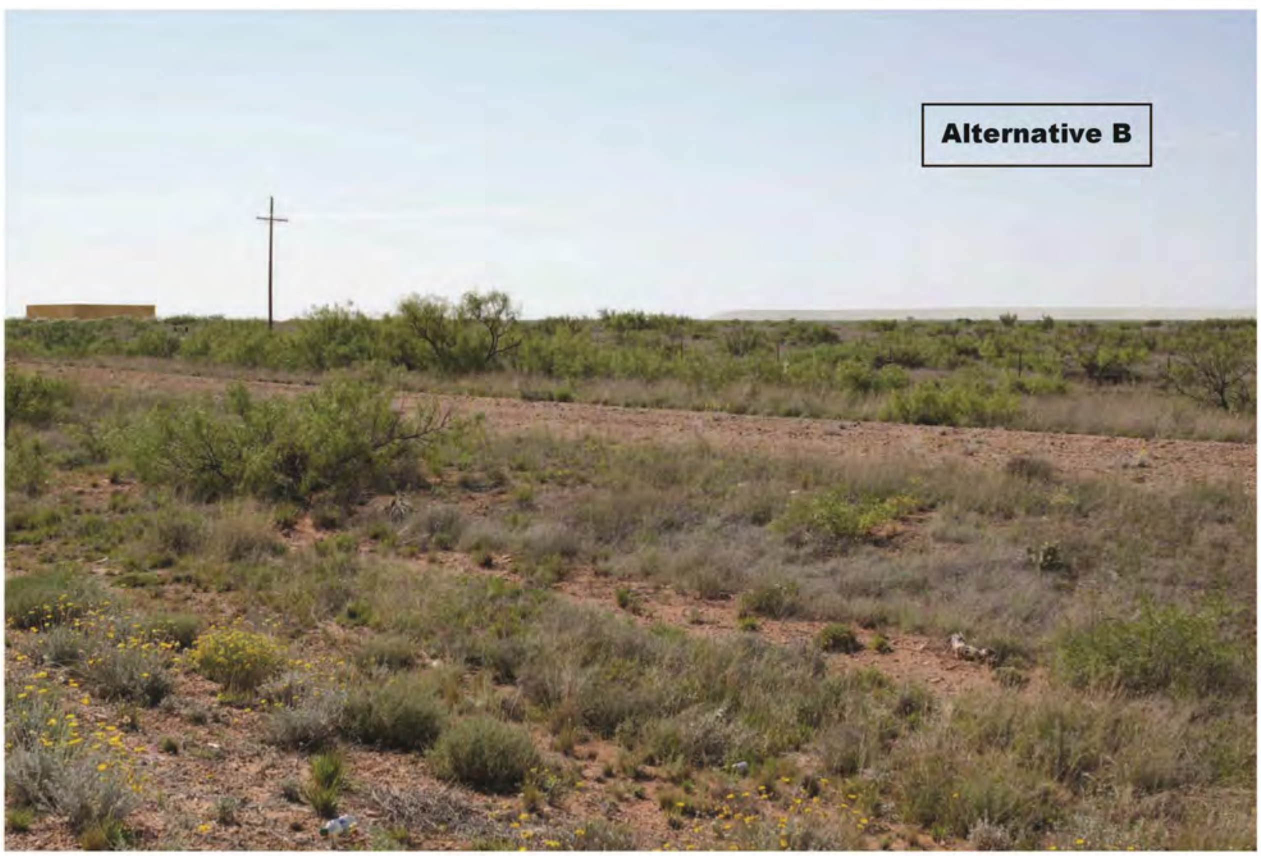


Figure 4.12-11 Existing and Proposed View of Processing Plant Site from KOP 2 Under Alternative B—Natural Shape Tailings Stockpile

Figure 4.12-12 Existing and Proposed View of Processing Plant Site from KOP 3 Under Alternative B—Natural Shape Tailings Stockpile

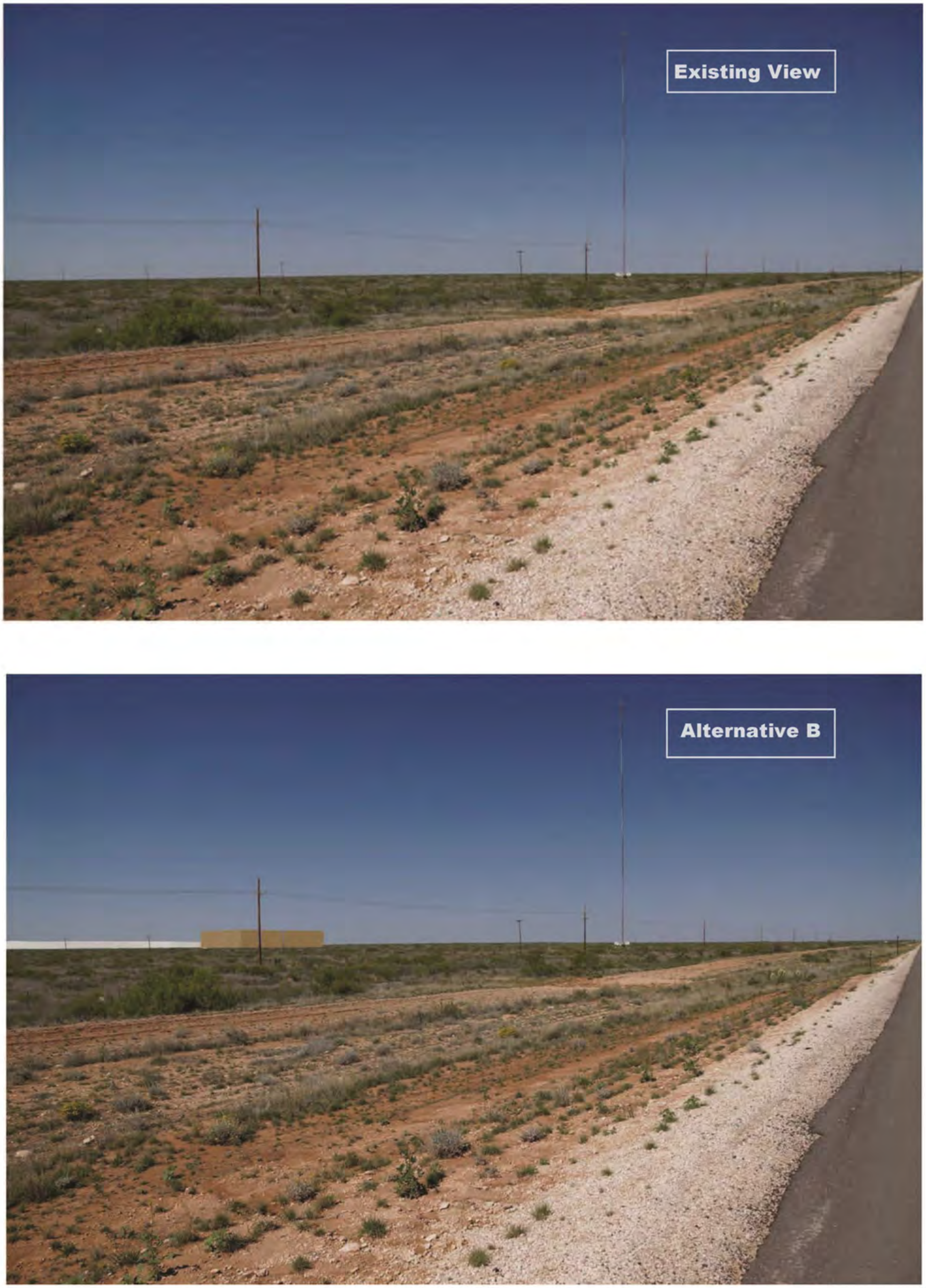


Figure 4.12-13 Existing and Proposed View of Processing Plant Site from KOP 4 Under Alternative B—Natural Shape Tailings Stockpile

Figure 4.12-14 Existing and Proposed View of Dry Stack Tailings at Processing Plant Site from KOP 5 Under Alternative D

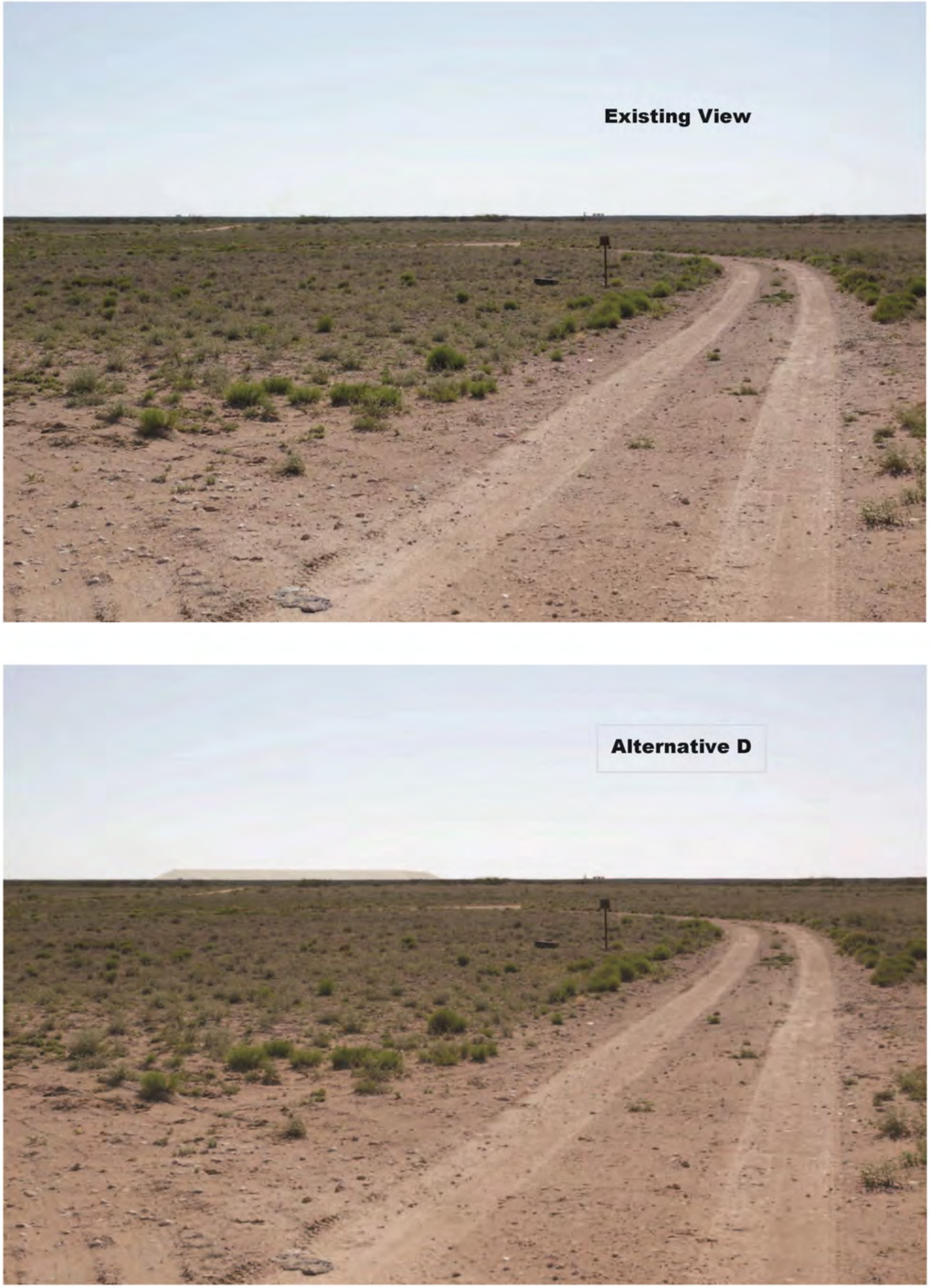


Figure 4.12-15 Existing and Proposed View of Dry Stack Tailings at Processing Plant Site from KOP 1 Under Alternative D

4.13 Cultural Resources

4.13.1 Issues

Primary issues of concern include actions that result in adverse effects to properties listed or eligible for listing on the NRHP or considered important to Native American groups. These actions include:

- Ground-disturbing activities
- Subsidence
- Erosion
- Illegal collection of artifacts
- Vandalism
- Unanticipated discoveries

4.13.2 Methods of Analysis

Analysis of impacts to cultural resources was performed by reviewing reports of cultural resource investigations that have been completed in the project area, some of which were conducted for ICP specifically for the proposed project. The locations and character of the recorded sites were compared to the areas of the proposed project where surface disturbance is proposed to identify important sites that may be affected or should be mitigated.

Section 106 of the NHPA requires that federal agencies take into account the effect of an undertaking on historic properties. Historic property, as defined by the regulations that implement Section 106, means "any prehistoric or historic district, site, building, structure, or object included, or eligible for inclusion, in the NRHP maintained by the NPS." The term includes properties of traditional religious and cultural importance to any Native American tribe or Native Hawaiian organization that meet the National Register criteria.

Potential impacts to NRHP-eligible sites are assessed using the "criteria of adverse effect" (36 CFR 800.5[a][1]): "An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association." There are five broad categories of effect:

1. Physical destruction or alteration of a property or relocation from its historic location;
2. Isolation or restriction of access;
3. Change in the character of the property's use or of physical features within the property's setting, or the introduction of visible, audible, or atmospheric elements that are out of character with the significant historic features of the property;
4. Neglect that leads to deterioration or vandalism; and
5. Transfer, sale, or lease from federal to non-federal control, without adequate and legally enforceable restrictions or conditions to ensure the preservation of the historic significance of the property.

Under NEPA, effects to NRHP-eligible sites can be direct or indirect. Direct effects are caused by an undertaking and occur at the same time and place (40 CFR 1508.8[a]). These types of effects to NRHP-eligible sites include physical damage resulting from surface-disturbing activities and can occur to both known sites and subsurface sites. Indirect effects are caused by an undertaking and are later in time or farther removed in distance, but are still reasonably foreseeable (40 CFR 1508.8[b]). These types of effects often are not quantifiable and can occur both within and outside of the APE. Indirect effects to NRHP-eligible sites include, but are not limited to, changes in erosion patterns due to construction activities, inadvertent damage due to off-road maintenance traffic, and illegal artifact collection due to increased access to an area.

4.13.3 Assumptions

- Class III field inventories will be conducted for all proposed disturbance areas prior to construction.
- Because the BLM is the lead agency, cultural resource protection and mitigation on all lands affected by the project will be in accordance with NHPA (P.L. 89-665; 16 USC 470 *et seq*, as amended) requirements, BLM standards, and the Protocol Agreement between the BLM and the New Mexico SHPO (BLM 2004).
- Resources or sites of tribal concern will be protected in accordance with tribal consultation requirements and federal regulations.
- Where avoidance is not possible, mitigation measures will be developed in accordance with NHPA requirements, BLM standards, and the Protocol Agreement.
- The BLM will continue tribal consultation throughout the environmental review and construction phase of the proposed project, if approved. Renewed contacts with some or all of the tribes may result from unanticipated discoveries.
- If ineligible sites were damaged by project-related activities, this would not be considered a significant impact.

Impacts to cultural resources would be considered significant if there were adverse effects to NRHP-eligible sites that cannot be mitigated.

4.13.4 No Action Alternative

Under the No Action Alternative, the project would not be approved and ICP's proposed new potash mine, processing facilities, ponds, loadout facility, well field, and water pipeline would not be constructed, leaving the current uses of the land in the project area unchanged. No ground-disturbing activities associated with the proposed project would occur and there would be no associated adverse effects to NRHP-eligible sites located in the proposed project area. Therefore, no significant impacts are anticipated under the No Action Alternative.

4.13.5 Alternative A—Proposed Action

Although effects to NRHP-eligible sites are determined on a site-specific basis, certain activities that are associated with the Proposed Action have a greater potential to adversely affect these sites than do others. Ground-disturbance associated with construction of the mine shaft and processing facilities, could result in direct effects to NRHP-eligible sites. These effects could result in the vertical and horizontal displacement of soil containing cultural materials and the resulting loss of integrity, loss of information, and the alteration of a site's setting without avoidance or mitigation. Effects on cultural resources would be the same for either power supply option.

Potential indirect effects to NRHP-eligible sites or other cultural resources located within or outside of the project APE could include erosional effects from runoff or pond discharge, off-road travel associated with construction and maintenance activities, and illegal collection, inadvertent damage, and vandalism due to increases in both surface disturbance and the number of people in the project area. Other potential indirect effects could include subsidence as a result of mining. Subsidence could damage archaeological sites, affect the stratigraphic integrity of buried archaeological deposits, and adversely affect the integrity of a site's setting. In addition, subsidence could affect surface drainage flow, an indirect effect that could result in erosional impacts to surface and buried archaeological sites. Erosion and subsequent redeposition can produce a secondary deposit of archaeological material that contains no contextual integrity.

The potential for the discovery of unanticipated archaeological deposits during construction activities exists within proposed disturbance areas and could result in direct effects. Unanticipated discoveries could result in displacement or loss (either complete or partial) of the discovered material. Displacement of archaeological deposits affects the potential to understand the context of the site and limits the ability to extrapolate data regarding prehistoric activity, settlement and subsistence patterns.

Avoidance would be recommended for all NRHP-eligible sites. If avoidance is not possible, the BLM or the State Land Office (depending on the location of the disturbance) would determine whether construction of the proposed project would have an adverse effect on these sites. If the BLM determines that eligible sites would be adversely affected, then mitigation would be proposed and implemented in accordance with NHPA requirements and the Protocol Agreement.

Three sites at the processing plant site (LA 108617, LA 172154, and LA 172155) were recommended as NRHP-eligible and would need to be mitigated through data recovery and documentation, with appropriate curation of artifacts as necessary. On October 23, 2013, a draft treatment plan for these sites was sent by the BLM to the NM SHPO and the seven tribes or pueblos that are consulted for project activities by the BLM Carlsbad Field Office.

One NRHP-eligible site near the proposed mine shaft (LA 172167) would be avoided by project construction and operations activities.

Based on Class III field inventories of the northern part of the proposed well field and along the proposed water pipeline, no cultural resources would be affected by construction. Inventories of the remainder of the well field would be completed with eligibility determinations prior to project construction.

At the loadout facility, the nine recorded sites on state or private land with undetermined NRHP eligibility would be flagged and avoided during project construction.

Potential indirect effects to NRHP-eligible sites located within and outside of the APE as a result of runoff or pond discharge are anticipated to be minor based on the proposed surface water control system and implementation of erosion control measures. Vehicle access would utilize existing roads to reduce the potential for indirect impacts associated with off-road vehicle travel during construction and maintenance activities. To minimize the potential for illegal collection of artifacts, vandalism, and inadvertent damage, all employees and subcontractors would be informed that archaeological sites are to be avoided by all personnel, vehicles, and equipment, and that it is illegal to collect, damage, or disturb cultural resources on federal land.

To minimize potential impacts associated with subsidence would require monitoring of any recorded sites within the subsidence area, approximately 1,500 feet around the 50-year mine area as part of ICP's subsidence monitoring plan.

According to BLM requirements, a data recovery and treatment plan that is reviewed and approved by a BLM archaeologist must be developed and implemented prior to construction. The data recovery plan would detail the steps to be taken if any previously unknown archaeological sites or human remains are discovered during project-related construction. If discoveries are made, all construction activities would cease in the area of the discovery, and the BLM Authorized Officer (AO) would be notified of the find. Steps would be taken to protect the site from vandalism or further damage, such as fencing or other security measures, until the BLM AO could evaluate the nature of the discovery. Adverse impacts to NRHP-eligible sites discovered during construction would be mitigated through data recovery per the Protocol Agreement. If construction or other project personnel discover what might be human remains, funerary objects, or items of cultural patrimony, then construction would cease in the area of the discovery, and the BLM AO and local BLM law enforcement officer would be notified of the find within 24 hours. Steps would be taken to protect the remains from vandalism or further damage, such as fencing or other security measures. Any discovered Native American human remains, funerary objects, or items of cultural patrimony would be handled in accordance with the NAGPRA.

Several of the ineligible sites and isolated occurrences documented during surveys would be removed during project construction. No significant adverse impacts to recorded NRHP-eligible sites would occur under the Proposed Action as long as the regulations, BLM policies, and applicant-committed measures are implemented.

4.13.6 Alternative B

The extent of surface disturbance under Alternative B would be similar to that for the Proposed Action. If the footprint of the tailings stockpile were expanded to reduce the total height, the acreage of long-term surface disturbance would increase in or adjacent to the proposed processing plant site. More ground disturbance would increase the potential for direct impacts to cultural resources that may be eligible for the NRHP. Class III cultural resources inventories of the expanded footprint outside the processing plant boundaries would be required prior to expanding the tailings stockpile footprint. If NRHP-eligible sites are located during the inventories and cannot be avoided, potential impacts would be mitigated as described above for the Proposed Action.

4.13.7 Alternative C

The acreage and location of surface disturbance would be the same as that for the Proposed Action; therefore, impacts to cultural resources under Alternative C would be the same as the Proposed Action.

4.13.8 Alternative D

Under Alternative D, the extent of surface disturbance would be similar to that for the Proposed Action, but the evaporation ponds and tailings stockpile would be located to the east. Impacts to cultural resources from construction of the ponds and tailings stockpile are unknown until Class III cultural resources inventories are completed with NRHP eligibility determinations prior to project construction. If NRHP-eligible sites are located and cannot be avoided, potential impacts would be mitigated as described above for the Proposed Action and in the following Mitigation Measures section.

4.13.9 Preferred Alternative

The acreage and location of surface disturbance would be the same as that for the Proposed Action; therefore, impacts to cultural resources under the Preferred Alternative would be the same as the Proposed Action.

4.13.10 Mitigation Measures

The following mitigation measures should be implemented:

- To protect NRHP-eligible sites located adjacent to project construction, sites should be flagged or fenced prior to the start of construction.
- A BLM-approved archaeologist would monitor project construction in areas with the potential for buried cultural remains and where recorded NRHP-eligible sites or sites with undetermined eligibility are to be avoided. The BLM would determine which areas require a monitor. Project construction should not begin prior to arrival of the monitor.
- Data recovery of eligible sites must comply with an approved data recovery and treatment plan.

4.13.11 Summary of Impacts

Alternatives A, B, C, D, and the Preferred Alternative may result in the loss of archaeological sites that are not eligible for the NRHP. Although these sites were recorded to BLM standards and the information integrated into local and statewide databases, the sites ultimately would be destroyed by project construction. Ineligible sites have no legal protection and their destruction is not considered an adverse or significant impact.

Three NRHP-eligible sites at the processing plant site would be excavated and documented according to the data recovery treatment plan. Other NRHP-eligible sites or undetermined sites identified within proposed disturbance areas would be avoided. Although NRHP-eligible sites would be mitigated through implementation of data recovery, some of the cultural value associated with these sites cannot be fully mitigated; therefore, it is anticipated that residual impacts to these resources would occur. Inventories of the remainder of the well field would be completed with eligibility determinations and cultural resources clearances finalized prior to project construction.

Indirect effects, such as illegal collecting of artifacts, have occurred and most likely would continue to occur in the project area through increased access, development, and increased human presence, as a result of past, present, and reasonably foreseeable future actions.

4.13.12 Cumulative Impacts

It is assumed that existing oil and gas infrastructure was surveyed for cultural resources and approved for surface disturbance prior to construction. Future development from oil and gas, in combination with the proposed project, would add to the potential for direct and indirect effects on cultural resources in the region. However, compliance with state and federal laws would minimize or avoid adverse effects and survey, testing, and excavation of NRHP-eligible sites would add to the regional knowledge of the cultural history.

4.14 Hazardous Materials, Health and Safety

4.14.1 Issues

Hazardous materials, health, and safety issues associated with the proposed project include:

- The potential for a spill to contaminate water and soil resources.
- The potential for a spill to harm employees and members of the public at the spill site.
- Unauthorized personnel entering areas where active mining operations are taking place.
- Increased traffic on local and area roads.

4.14.2 Method of Analysis

The mine plan and other relevant documents were reviewed to determine how hazardous materials and solid wastes would be handled if the proposed project were approved. The potential risk for contamination of soil and water resources from spillage or improper disposal was determined qualitatively based on existing plans.

4.14.3 Assumptions

Assumptions for analysis are as follows:

- ICP will draft a project-specific emergency response plan.
- Employees will be trained in safety procedures and will be expected to follow all established safety procedures.

- ICP will draft a project-specific SPCC Plan.
- If some of the chemicals identified for use during the life of the proposed expansion were to enter the environment in an uncontrolled manner, there could be associated direct or indirect adverse effects.

4.14.4 No Action Alternative

Under the No Action Alternative, mining activities would not take place within the project area, so there would no threat of release of hazardous materials and no threat to public health and safety from project-related activities.

4.14.5 Alternative A—Proposed Action

Under the Proposed Action, the transport, storage, use, and disposal of hazardous materials for mine operations would continue for the 50-year life of the project and through site closure and reclamation.

4.14.5.1 Health and Safety

Precautions would be taken to ensure the health and safety of the public as well as mine employees. A controlled entrance to the mine site would allow access to only authorized personnel. The plant facilities would be fenced to protect against vandalism and to protect against the entrance of unauthorized personnel. ICP employees would be required to take multiple forms of safety training and adhere to safety regulations. A Wildfire Management Plan also would be developed to outline ICP’s responsibilities for local and regional firefighting management.

As a result of oil and gas wells within the mine, the mine would be operated under Category IV of the MSHA (30 CFR Part 57.22003). This classification would entail that all mine equipment and ventilation follow the rules and regulations under the gassy mine Category IV classification.

Increased traffic would occur as a result of construction and operations potentially resulting in a health and safety risk; however, it is anticipated that the increase in traffic would not greatly affect normal traffic levels.

4.14.5.2 Hazardous Materials

Storage and Use

ICP would prepare SPCC plans for the proposed plant facilities and any other location where hazardous materials would be stored or used. These plans would be in compliance with 40 CFR Part 112, would describe the required level of containment and safety measures associated with storage, handling, and spill clean-up of oil, including but not limited to petroleum, fuels, sludge, used oil, and mineral oil (ICP 2011). Operations conducted in accordance with the SPCC Plan would ensure that impacts from spills would be minimized and the spilled materials would be contained and removed. ICP would have the necessary spill containment and cleanup equipment available at the site, and personnel would be able to quickly respond. The operation of the cogeneration facility under the Onsite Power Supply option would most likely increase the quantities and types of hazardous and other chemicals stored onsite. However, this would be addressed in the site-specific SPCC Plan for the Plant Site should this option be selected.

All hazardous substances would be handled in accordance with applicable MSHA regulations. The hazardous materials to be used under the Proposed Action would be handled as recommended on the manufacturer's Material Safety Data Sheets. Based on the facility’s design features and the operational practices in place, the probability of a major release occurring at the site during the life of the proposed solution mine project would be low.

Disposal

All hazardous waste generated at the mine would be transported to licensed disposal facilities in accordance with applicable federal and state regulations. Other solid wastes would be disposed of appropriately depending upon waste type.

Potential Effects of a Release

The environmental effects of a release would depend on the material released, the quantity released, and the location of the release. Potential releases could include a small amount of diesel fuel spilled during transfer operations at the mine site to the loss of several thousand gallons of diesel fuel or reagent into a drainage.

The release of a hazardous material or waste into a sensitive area such as stream, wetland, or populated area is judged to be very unlikely. Depending on the material released, the amount released, and the location of the release, an accident resulting in a release could adversely affect soils, water, biological resources, and human health.

Response to a Release

All spills, including transportation and loading/unloading spills occurring on site, would be cleaned up as soon as possible. If a spill exceeds the reportable quantity, it would be reported to the NMED, USEPA, National Response Center, and the BLM.

In the event of a release on the way to the facilities in the project area, the transportation company would be responsible for response and cleanup. Law enforcement and fire protection agencies also may be involved to initially secure the site and protect public safety. Hazardous materials transporters are required to maintain an emergency response plan, which details the appropriate response, treatment, and cleanup for a material spilled onto land or into water.

For onsite spills, the procedures outlined in the SPCC Plan would be used to respond to petroleum and fuel spills. Specific procedures would be developed for other hazardous materials stored and used at the mine and the mill. Any cleanup would be followed by appropriate restoration of the disturbed area, which could include replacing removed soil, seeding the area to minimize erosion, and the return of the land to its previous use.

4.14.6 Alternative B

There would be no difference in health and safety concerns or hazardous materials use and solid waste generation under this alternative as compared to the Proposed Action. Therefore, the potential impacts would be the same as described for the Proposed Action.

4.14.7 Alternative C

There would be no difference in health and safety concerns or hazardous materials use and solid waste generation under this alternative as compared to the Proposed Action. Therefore, the potential impacts would be the same as described for the Proposed Action.

4.14.8 Alternative D

There would be no difference in health and safety concerns or hazardous materials use and solid waste generation under this alternative as compared to the Proposed Action. Therefore, the potential impacts would be the same as described for the Proposed Action.

4.14.9 Preferred Alternative

There would be no difference in health and safety concerns or hazardous materials use and solid waste generation under this alternative as compared to the Proposed Action. Therefore, the potential impacts would be the same as described for the Proposed Action.

4.14.10 Mitigation Measures

A project-specific emergency response plan should be prepared for the new plant facilities, the Jal loadout, and underground mining operations.

4.14.11 Summary of Impacts

Effects from the use of hazardous materials under the all action alternatives would depend on the substance, quantity, timing, location, and response involved in the event of an accidental spill or release. Operation in compliance with applicable regulations and in accordance with the facility's SPCC Plan, and the prompt cleanup of potential spills and releases would minimize the potential for impacts under all alternatives.

4.14.12 Cumulative Impacts

The existing and future oil and gas operations in the vicinity of the project area store and use some hazardous materials onsite. These would be required to comply with spill plans and permits, as would the proposed Ochoa Mine operations. While the increased number of industrial sites in the region increases the potential for spills that could affect health and safety, this adverse effect would be kept to a minimum as long as the operations are in compliance state and federal permits and requirements.

4.15 Socioeconomics

4.15.1 Issues

The primary issues associated with socioeconomic resources include direct or indirect impacts to the local economy in terms of jobs, local labor markets and income, effects on other economic activities, population trends and migration, housing markets, public facilities and services, public sector fiscal resources, and social conditions in the region. Short- and long-term effects would result from the temporary construction and long-term operating jobs associated with the proposed Ochoa Project, the capital investments made by ICP or by other parties on behalf of the applicant, and the ongoing production, processing and shipment of mineral product. Indirect socioeconomic effects would arise from the incremental demands for goods and services and circulation of money in the region supported by the direct jobs and investments.

4.15.2 Method of Analysis

The assessment of project-induced effects on social and economic values included review and analysis of existing conditions and trends in population and demographics, migration, economic activity, employment, labor force participation, earnings and income, poverty, land use, housing, local government facilities, services and fiscal conditions, social organization and attitudes and opinions. Information was compiled from available secondary sources, augmented by interviews with local officials and residents. Additional information for the social assessment was obtained from BLM scoping documents and attendance at scoping meetings.

For the assessment, the potential social and economic effects of construction and operations of the proposed mine, processing and loadout facilities, and electrical power-supply facilities were identified by review and extrapolation of information contained in ICP's MPO, and considering the location and timing of work force and construction activities in the context of existing social and economic conditions, community infrastructure, and housing capacities. The assessment was informed by awareness and knowledge of the experience of communities with other natural resource development and construction projects, both within the project area and in other locations. Potential revenues associated with the construction and operations of the Ochoa Project were considered for their potential to offset public costs of providing services to the construction and operations work forces.

Two power-supply options are under consideration by ICP for the Ochoa project: electrical energy purchased from Xcel Energy, which would necessitate construction of approximately 45 miles of 230-kV transmission line to facilitate power delivery to the project site; or, construction of an onsite natural-gas fueled co-generation facility by ICP. The estimated capital investment cost to construct the co-generation facility is approximately $110 million; however that facility could result in an estimated reduction in operating costs of up to $15 million per year.

The cost and temporary construction work force requirements associated with the transmission line and associated interconnections and facilities are presently unknown, but information from other transmission line projects suggest that cost, labor requirements and duration of construction would all be lower than the corresponding metrics for the co-generation plant. Given those unknowns and expectations regarding the relative magnitudes of the work force, the socioeconomic analysis is based on the construction of the co-generation facility because it provides the more conservative assessment of the short-term project-related effects on short-term housing and population increases.

For this assessment, estimated employment and payroll provided by the applicant were the primary inputs for a regional economic assessment process using the **IM**pact Analysis for **PLAN**ning (IMPLAN) economic modeling software. IMPLAN is an input-output based economic model originally developed to assist the USFS in land resource management planning. Subsequently, the model and related software were transferred into the private sector, where it is the subject of ongoing refinement and enhancements to improve the program's analytical capacity to address a broader range of economic and impact planning issues. IMPLAN is widely recognized and accepted in regional economic and economic impact assessment circles. The model maps the flow of dollars through the region's economy and the interaction of individual sectors within the regional economy. The model considers the direct effects on the producing sector(s) of a change in economic activity and the secondary effects on other local sectors due to the linkages within the region's economy. The model is widely used for NEPA assessments and BLM planning initiatives across the west.

IMPLAN assumes that current relationships between sectors will remain constant in the future. The model does not consider potential changes in other sectors of the economy unless they are specified as inputs to the analysis. For this assessment, only the direct economic activity associated with the proposed Ochoa Project, defined in terms of employment, is considered in the IMPLAN modeling process. As noted below, the activities associated with the Proposed Action have the potential to have minor adverse effects on other economic activities such as grazing, outdoor recreation, and oil and gas development within the planning area. These potential effects are not addressed within the IMPLAN modeling process but are discussed in the following sections.

Applicant committed measures and BLM regulations were taken into account in determining significant impacts.

4.15.3 Assumptions

The following criteria are used to determine whether socioeconomic impacts would be significant:

- Substantial long-term change in any sector of the local economy, such as major expansion or contraction of employment, economic output or diversity, or the economic well-being of residents.
- A change in county or community population that would strain the ability of affected communities to provide or maintain housing and services or otherwise adapt to growth-related social and economic changes.

- An aggregate change in public sector revenue and expenditure flows likely to result in an inability on the part of affected units of government to maintain public services and facilities at established service levels, or to allow for improved services without a major increase in tax burdens on existing taxpayers.
- Permanent displacement of residents or users of affected areas that would result from project-induced changes in or conflicts with existing uses or ways of life.
- Disproportionately high and adverse environmental or human health impacts to an identified minority or low-income population, which appreciably exceed those to the general population around the project area.

4.15.4 No Action Alternative

The No Action Alternative describes future socioeconomic conditions in the project area assuming denial of the requested approvals for the proposed project. Under the No Action Alternative, the BLM would deny ICP's application for ROWs, MPO, and request for preference right leases, allowing the prospecting leases to expire. As a result, the proposed new mine, processing facilities, loadout facility, and water pipeline would not be constructed, leaving the current uses of the land in the project area unchanged. The potential impacts to the human environment described under the Proposed Action would not occur.

Circumstances that could result in the selection of the No Action Alternative include a determination that the polyhalite cannot be economically recovered under the lease terms required by the BLM, or the BLM determines that the leases are not in the public interest. Assuming the former determination, no leases would be issued and the project would not proceed, at least in its current form. Under the latter circumstance, other leases or other compensation would be offered to ICP. However, given the unknowns regarding the type of compensation, an assessment of effects of potential development would be speculative and beyond the scope of this analysis. In either eventuality, the No Action Alternative represents a "status quo" scenario, assuming the continuation of the existing economic drivers and influences affecting Lea and Eddy counties and the communities in the region in which the future does not include the discrete actions and effects associated with ICP's proposed project. These drivers include, but are not limited to the following:

- Potash production from existing operations at other mines and processing facilities
- Oil and gas development
- Operation of the Federal Law Enforcement Training Center
- Long-term operation of the WIPP
- Seasonal tourism and recreation, anchored by Carlsbad Caverns and Guadalupe Mountains NPs
- Continued operation and possible expansion of the URENCO NEF
- Dairy and crop farming and ranching
- Retirement migration (primarily in the Carlsbad area)
- Other industrial and renewable energy development

No Action would result in foregone economic opportunity for the company, an opportunity having economic and social implications for the community and fiscal implications for federal, state, and affected local governments. The EIS focuses on the localized effects because an assessment of the broader implications of these foregone opportunities is beyond the scope of this analysis.

At the same time, the No Action Alternative acknowledges uncertainties introduced by currently unknown factors and events that could exert even more influence on growth and development in the assessment area over the long term. Perspectives regarding those influences may vary widely among individuals, groups and organizations.

4.15.4.1 Economic Effects

Continuation of the key economic drivers listed above would be anticipated to sustain the region's economy for the foreseeable future, providing a relatively high degree of economic vitality and diversity for local residents and a fiscal foundation for local government. The No Action Alternative includes continued oil and gas development and its associated local employment, income, and economic activities. The actual future level of such activity will vary over time in response to energy prices, market demand, and continuing evolution of drilling and production technology. Factors that could support future growth include an increased pace of oil and gas development and ongoing retirement migration in the Carlsbad area, which could trigger additional residential and commercial construction.

4.15.4.2 Population and Demographics

Population projections prepared by the University of New Mexico Bureau of Business and Economic Research (UNM-BBER) in 2008 (the most recent available) anticipated moderate to strong long-term growth for Lea and Eddy counties, with net growth of approximately 14,800 (24 percent) and 7,500 (14 percent) residents projected between 2010 and 2035 (UNM-BBER 2008). The projected population growth rate in Lea County is considerably lower than forecasts for the Albuquerque metropolitan area, but higher than most rural areas of the state, while that for Eddy County is mid-range among all counties in the state.

4.15.4.3 Housing

Anticipated baseline population growth under the No Action Alternative would require additional long-term residential and commercial development. Such development is consistent with the long-term plans adopted by local governments.

4.15.4.4 Public Infrastructure, Services, and Local Government Fiscal Conditions

Lea and Eddy counties, local municipal governments and school districts engage in long-term planning efforts intended to prepare for growth and economic development. These efforts, and the plans that result, establish the groundwork for capital improvement programs and provision of public facilities and services in a fiscally responsible manner. The Lea County Affordable Housing Plan (2011) (which contains individual community plans), the Hobbs Comprehensive Community Development Plan (City of Hobbs 2004), the Eddy County Comprehensive Plan, last updated in 2008 (Eddy County 2008), and the Greater Carlsbad Housing Analysis and Strategic Plan (City of Carlsbad 2009) are all predicated on long-term growth. Supporting the existing energy, mining, and other industrial and visitor industries and their role in the region's economic, social, and fiscal framework is consistent with the achievement of such growth. So too is the pursuit of further long-term economic growth and diversification. The magnitude, timing, and net implications of growth associated with existing and potential future economic activities are uncertain, as are the demands associated with such growth. Implementation of the No Action Alternative would avoid the short- and long-term demands associated with the Ochoa Project-related incremental growth, but also preclude the related incremental increase in public sector revenues.

Mineral royalties, state severance and conservation taxes, local ad valorem, and other public sector revenues would accrue from any future fluid mineral development and production from the project area. The magnitude and distribution among governmental entities of such revenues would be a function of the location, production costs, quantities sold, market values, and other factors.

4.15.4.5 Social Organization and Conditions

Current social conditions and trends in the analysis area would be unaffected by implementation of the No Action Alternative. Potentially affected groups including grazing operators, hunters, and OHV users of the project area would similarly not be affected. Implementation of the No Action Alternative would eliminate project-related concerns of oil and gas operators with current, historical, and potential future interests within the project area.

4.15.5 Alternative A—Proposed Action

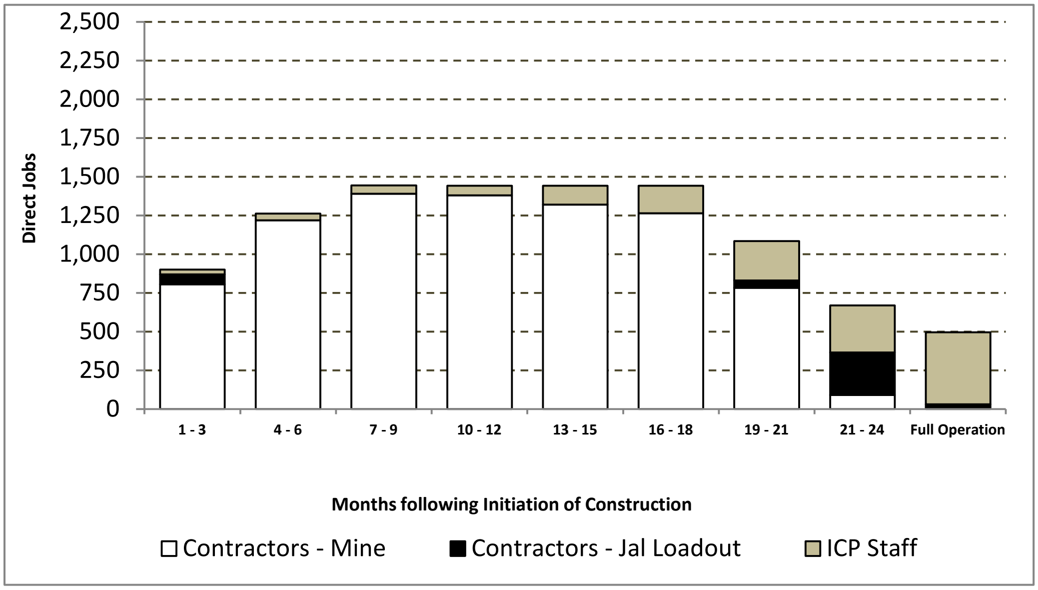
Implementation of the Proposed Action would involve construction of proposed mining, processing and electrical energy facilities over an approximately 24-month period, followed by a 50-year period of operations during which underground mineral resources would be mined, brought to the surface, processed, and then transported to a rail loadout facility for shipment to market. ICP estimates a capital investment requirement of approximately $960 million to implement the Proposed Action assuming the offsite transmission line option. Capital investment of an unknown amount by Xcel Energy also would be required. If built, the transmission line would have capacity to serve other demand in the region. However, the magnitude and timing of ICP’s demand is considered the primary factor that would drive construction of the line at this time.

ICP’s estimated capital investment for the project assuming the co-generation power supply option is $1,070 million. Following construction, ICP estimates ongoing operating costs of $65 million during a typical year at full production assuming use of purchased offsite power. The company estimates potential savings of up to $15 million annually in operating costs with the onsite generation option. Reclamation would follow the completion of production. The social and economic effects described below would be incremental effects to those associated with ICP’s current operations.

4.15.5.1 Economic Effects

Construction and operation of the proposed mine, processing facility and rail loadout, and power supply facilities would introduce additional economic stimulus into the regional economy, expanding the work force, population and tax base. ICP anticipates a 24-month construction and development phase, with the transition to operations beginning approximately 18 months after the onset of construction. The majority of development activity for the mine and plant would occur over the first 21 months of the 2-year construction schedule. Construction activity at the rail loadout would occur during the initial 3 months of construction to facilitate the subsequent use of the siding for delivery of equipment and materials, and again during the last 6 months of the development schedule when the loadout facilities would be built. In-place mineral reserves would support full-scale production for 50+ years. Construction activity of the onsite co-generation facility would occur concurrently with construction of the mine and plant such that power production capacity would be available to support the initiation of mining and processing. Construction of the offsite transmission line could likely be completed within a 6- to 9-month period, and be scheduled to facilitate power delivery at the time that underground mining begins.

Work force estimates provided by ICP, assuming an onsite co-generation facility, anticipate a rapid ramping up of Ochoa Project-related construction employment, with an average of 900 workers during the first three months of activity, including 30 management personnel and other ICP staff. Direct project employment would continue to climb to a peak of about 1,440 employees in month 7, remaining at that level through month 18 (**Figure 4.15-1**). Between 100 and 200 jobs would be associated with the construction of the onsite co-generation facility. The short-term peak work force for the Ochoa project during construction is equivalent to 80 percent of the peak construction work force associated with the URENCO NEF facility. Overall direct employment would decline over the last 6 months of development as construction of the plant and rail loadout is completed. During the latter period some pre-production activities would be occurring, and the number of ICP staff would correspondingly increase (Shonnard 2012).



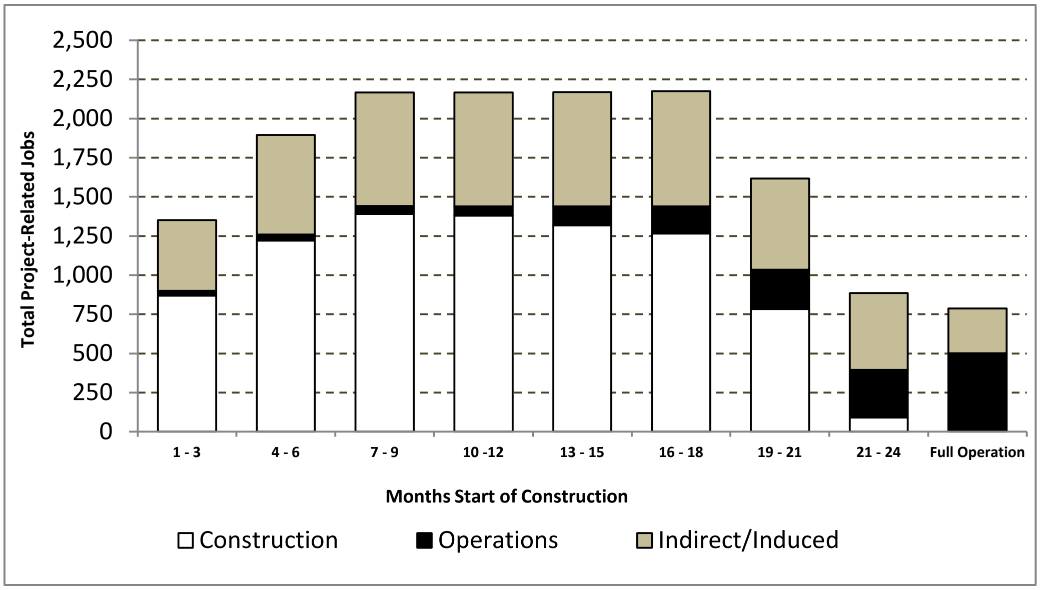
Note: This figure reflects the onsite co-generation power supply option. Employment would likely be lower than shown during the first 12 months with the offsite transmission line option.

Source: Shonnard 2012.

Figure 4.15-1 ICP Ochoa Project Estimated Direct Construction Jobs

At full-scale production, ICP's proposed project would directly support 465 jobs at the mine and plant and another 31 contract employees associated with the truck haul operation transporting product from the plant to the rail loadout. The Texas-New Mexico Railroad may expand its workforce in conjunction with the project-related increase in rail traffic, but the number of hires would likely be low. The direct work force would increase by 6 workers given an ICP decision to proceed with the onsite co-generation option. Ongoing production is expected to sustain the direct employment at those levels for 50+ years.

Purchases of machinery, equipment, and supplies by ICP and its contractors, along with purchases of goods and services by the company's employees and those of its contractors would indirectly support other jobs in the surrounding economy through a process commonly known as the "economic multiplier." Based on the size and composition of the regional economy and the economic linkages between the mining industry and other sectors of the economy, the IMPLAN model estimates 50 additional jobs would be supported in the regional economy for every 100 construction jobs and associated investment. The IMPLAN multiplier for operational jobs is 0.57 secondary jobs. Typically the employment multipliers for the mining industry are substantially higher than those associated with construction, but in this instance the difference is not substantial, apparently a reflection of the high capital investment and productivity associated with the new plant, and reliance on non-local sources of equipment and materials. The net results of the multiplier effect would be short-term support of an additional 452 indirect and induced jobs during the initial quarter of construction, rising to 728 jobs during the peak 12-month period (**Figure 4.15-2** and **Table 4.15-1**). Many construction-related secondary jobs would be based in Lea and Eddy counties in the temporary lodging and eating and drinking establishments that would serve temporary workers. The geographic concentration of construction-related jobs in Lea and Eddy counties would be similar regardless of the power supply option implemented. Secondary jobs in mining support establishments would likely be based in Eddy County as a result of the location of the potash mining support industry in and near Carlsbad.



Note: This figure reflects the onsite co-generation power supply option. Employment would likely be lower than shown above during the first 12 months with the offsite transmission line option.

Source: Shonnard 2012.

Figure 4.15-2 Total Temporary Employment Effects Associated with the Ochoa Project

Table 4.15-1 Total Employment Effects of the Proposed Action

	Initial Construction (Months 1 – 3)	**Peak Construction (Months 7 – 18)** [1]	**Long-term Operations (50 years)** [1]
Project Direct	900	1,440	502
Indirect and Induced [2]	452	728	286
Total New Jobs Supported	1,352	2,168	788

[1] Assumes construction of the onsite co-generation facility.

[2] Indirect and induced job multipliers are 0.5 per direct construction job and 0.57 per direct operations job, per IMPLAN model for Eddy County.

Following the completion of construction, and assuming the onsite generation option, the operational employment at the Ochoa Project would support an estimated 286 indirect and induced jobs elsewhere in the economy. The net result would be a long-term beneficial gain of 788 jobs in the regional economy.

A substantially smaller number of direct and indirect jobs would be supported during final reclamation following the completion of production.

Construction and operations of the Ochoa Project would both benefit and stress local labor markets, increasing the short and long-term job opportunities for residents and reducing unemployment. At the time of this assessment (third quarter of 2012) local unemployment was relatively low due to the increased oil and gas activity associated with higher oil prices, a strong market for potash, and ongoing operations and construction of the URENCO NEF facility and other industrial projects. Seasonal demand for labor also rises in conjunction with tourism, particularly in Eddy County.

Although the local labor force includes many skilled workers and candidates due to the relatively large size and established nature of the construction and mining industries in the economy, most of these workers are currently employed. With unemployment at less than 4.0 percent at the end of 2012, the outlook for local labor to fill the indirect and induced jobs support by the project also is constrained; "local labor" includes locally based contractors, current residents of the study area, workers who live outside of the affected communities and commute to jobs on a regular basis without spending the night locally. In other words, local workers could include residents of Roswell who commute to jobs in Artesia, or residents of nearby communities in Texas who commute to jobs in Lea County. Consequently, ICP anticipates that it and the various construction contractors may need to rely on non-local workers to fill as many as 90 percent of the temporary jobs and a majority of the operations jobs associated with the project (Shonnard 2012).

Based on an assessment of labor availability, this analysis assumes that up to 389 jobs would be filled by local workers during the first quarter of construction activity, with that number increasing to 568 during the peak 12 months of construction. Achieving the anticipated level of local hiring during the peak construction period implies temporary increases in labor force participation among residents and the availability of local workers as other projects are completed. Even with the anticipated level of local hiring, nearly 1,000 non-local temporary workers would be required during the initial 3 months of construction, increasing to a peak of 1,602 non-local workers during the 12-month peak (see **Table 4.15-2**).

Table 4.15-2 Residency Status of Workers Filling Temporary Jobs Associated with the Proposed Action

	Initial Construction (Months 1 – 3)	Peak Construction (Months 7 – 18) [1]	Long-term Operations (50 years) [1]
Total Jobs Supported	1,352	2,168	788
Less: Jobs Filled by Residents and Commuters[2]	- 389	- 568	- 250
Equals: Jobs to Be Filled by In-migrating Workers	= 963	= 1,602	= 538

1 Assumes construction of the onsite co-generation facility.

2 Local residents and commuters are assumed to fill between 25 and 33 percent of the direct, indirect and induced jobs supported by the proposed project.

Non-local workers also are anticipated to fill a large share of the long-term jobs, resulting in 538 new workers in the local labor force, with 250 jobs filled by current residents.

The Proposed Action would result in beneficial short-term and long-term increases in personal income in the region. Jobs in the construction and mining industries are among the highest paying jobs in the local economy, thereby contributing to enhanced economic welfare for the directly affected households. The short-term direct increases, consisting of wages, salaries, and the value of benefits to be paid to construction workers are estimated in excess of $340 million, the majority of which will accrue to non-residents, although a substantial amount also will accrue to local residents. Much of the income accruing to non-residents would leave the region, but the local economy would benefit from local purchases of goods and services made by non-local workers during their time of local tenancy.

Personal income associated with the indirect and induced jobs supported by the construction phase of the project would generate further increases in personal income.

Long-term gains in labor income associated with operations of the Ochoa Project are estimated at $39 million per year, extending over the 50-year life of the project. Although substantial, and with higher than average earnings per job, the overall total would represent approximately a 0.9 percent increase over the total income of the Lea and Eddy counties in 2010. Reclamation would generate additional short-term income in the future. The annual payroll costs would represent approximately 25 percent of the estimated total annual cash operating costs at full production.

Negligible decreases in local farm and ranch income could result in conjunction with reductions in grazing associated with surface disturbance and changes in land use, such declines affecting a small number of operators. Some future oil and gas related income could be foregone should the project result in a reduced level of development in the project area that might have otherwise occurred, although the long-term development potential for such activity in this location is uncertain. Limited adverse effect on personal income also could result from project-related reductions in outdoor recreation, although the current level of such activity is likely very low. Furthermore, rather than being eliminated, it is likely that such activity would continue occurring but be displaced to other locations. The gains in personal income associated with the Proposed Action would greatly offset these declines on a net basis.

Implementation of the Proposed Action also would generate other short- and long-term economic benefits in the form of business revenues and profits, returns to shareholders of corporate entities, public sector revenues, investments in real estate and other infrastructure. The value of some of these benefits will extend beyond the life of the project.

Adverse effects on other sectors of the economy beyond grazing, oil and gas, and outdoor recreation are not anticipated to arise in conjunction with the Proposed Action.

The economic infusion into the local economy associated with the Proposed Action represent long-term benefits of the project, contributing to the economic welfare of the region. The scale of these benefits, although substantial for an individual project, would be modest in relation to the overall size of the regional economy.

4.15.5.2 Population and Demographics

Temporary and long-term population increases in the region would result from work force migration to fill construction and ongoing operations-related direct, indirect and induced job opportunities supported under the Proposed Action. Based on proximity to the project site, highway transportation access, current and potential housing availability, and existing commercial and community infrastructure, the majority of the population increases would likely occur in Lea and Eddy counties, primarily in the communities of Jal, Eunice, Hobbs, and Carlsbad. The geographic distribution and approximate magnitude of the peak population impacts associated with the two power supply options would be similar.

The majority of non-local construction workers relocating to the area temporarily would do so in single status, that is, unaccompanied by other household members. Although some workers would be accompanied by a spouse, partner, and other household members, the number of families migrating into the area would be low during the construction phase, as would the number of accompanying school-age children.

The temporary population influx during construction is estimated at up to 1,428 persons during the initial 3 months of construction, climbing to 2,432 persons during the 12-month period from month 7 through month 18 of construction. Of the total project-related population increase, an estimated 581 workers during the first quarter of construction and a 12-month peak of 947 workers would relocate to the area in single status. Project-related population would decline to an estimated 1,336 as the project transitions to full production, assuming the onsite generation option (**Table 4.15-3**). ICP anticipates some temporary construction workers would secure long-term jobs at the mine and plant when operations begin, becoming residents of the region, but most would return to their permanent residence, or move on to another project when the project is completed. The long-term incremental population would be slightly lower with the offsite power supply option.

Table 4.15-3 Incremental Population Associated with the Proposed Action

	Initial Construction (Months 1 – 3)	Peak Construction (Months 7 – 18)	Full Production[1]
Single Status Workers	581	947	—
Relocating Workers & Households	847	1,495	1,336
Total	1,428	2,432	1,336

[1] Assumes construction of the onsite co-generation facility.

The non-local work force requirement would result in a substantial population influx to the region, with attendant impacts on temporary housing, local businesses, and some public facilities and services. If local labor is not available to meet the projected needs, either higher levels of immigration would result, or the level of indirect and induced response could be dampened, leaving jobs unfilled. If local and immigrating labor is insufficient to meet demands, either additional immigration would occur over time, or some available positions would remain unfilled. The increase in local job opportunities would contribute to the economic well-being of households in the region, but also would result in upward pressure on local wage rates, salaries, and competition for labor by employers.

Population Distribution

The residential distribution of the incremental population associated with the Ochoa Project direct construction and operations work forces would largely depend on the availability and cost of housing, with a strong preference among construction workers for locations that are “close” to the work site. At the same time, the willingness of construction and oil and gas workers to endure extended commuting times has been demonstrated repeatedly.

Temporary and conventional housing availability in the study area is currently limited due to strong demand associated with oil and gas development, and construction and operations of other industrial facilities. The community population assignments to nearby communities for the incremental Ochoa Project-related population shown in **Table 4.15-4** are derived considering the distance of the community from the Ochoa Project facilities, the population of the community, and existing and planned housing resources as they are currently known. Given current demand and the duration of the 24-month construction phase of the Ochoa Project, it would be reasonable to expect additional temporary housing would be developed to accommodate the construction work force, primarily in the form of RV parking spaces. It is further assumed that local housing markets would respond over time to production-related demand for conventional housing.

Some non-local workers may choose to reside in communities outside the study area, including the communities of Kermit and Andrews in Texas, approximately 43 and 67 miles from the project site, respectively, but, as discussed below, the number of such workers would likely be relatively small and would not result in noticeable effects on community infrastructure and services in these communities.

Table 4.15-4 New Population Assignments to Communities – Proposed Action

	Highway Distance (miles, one-way)	2010 Population	Assigned Share of Project-Related Population
Jal	23	2,047	10%
Eunice	35 / 46 *	2,922	20%
Hobbs	55 / 65 *	34,122	30%
Carlsbad	47	26,138	35%
Elsewhere in Lea and Eddy counties	NA	NA	5%

* The shorter distance is via the CR 21/Delaware Basin Road. The longer distance is via NM 128 and NM 18.

Table 4.15-5 displays incremental Ochoa Project-related population forecasts for nearby communities based on the population forecasts and assignments shown above.

Table 4.15-5 Projected Community Population Increases, Proposed Action

	Initial Construction (Months 1 – 3)	Peak Construction (Months 7 – 18)	Full Production[1]
Lea County			
Jal	143	243	133
Eunice	286	487	268
Hobbs	428	729	401
Eddy County			
Carlsbad	500	851	468
Other Lea and Eddy County	71	122	66
Total Population	1,428	2,432	1,336

[1] Assumes construction of the onsite co-generation facility.

Jal is the nearest community to the proposed Ochoa mine, processing facilities and rail loadout facility, the latter to be located on the outskirts of the town. During the fall of 2012, Jal had a limited inventory of available temporary or conventional housing, as most of the temporary housing in the community had been absorbed by oil and gas industry workers and construction workers from other industrial projects. Given Jal's proximity to the key components of the project, it is anticipated that it would attract approximately 10 percent of the incremental population associated with the Ochoa Project, resulting in a first quarter population increase of 143 (7 percent of 2010 Jal population), a peak increase of 243 (12 percent of 2010 population) during construction, and a long-term increase of 133 (6 percent of 2010 population) during full production. However, some new temporary and conventional housing resources were planned or under development at that time. Furthermore, the long-term housing needs may attract additional new development in the future, increasing the share of the incremental population locating in the community.

Eunice is the next closest community to the Ochoa mine and processing facility sites (approximately 35 miles by county road and 46 miles by highway) and offers a substantial inventory of temporary housing, primarily in the form of full-service RV parking spaces for rent. Consequently, it is anticipated that 20 percent of the incremental population associated with the Ochoa Project would reside in Eunice, which would result in a first quarter population increase of 286 (10 percent of 2010 Eunice population), a peak increase of 487 (17 percent) during construction, and an increase of 268 (9 percent) during full production.

Carlsbad is located approximately 47 miles from the Ochoa Project site, has a large inventory of motels and RV parks to accommodate temporary workers, and more than 400 additional multifamily apartment units under construction. Carlsbad is home to the support industry for the region's potash mining and processing industry and also many employees of the existing potash mines. It is assumed that 35 percent of the incremental Ochoa Project population would relocate to Carlsbad, which would result in population increases of 500 during the first quarter of construction (2 percent of 2010 Carlsbad population), 851 (3 percent) during the 12-month construction peak, and 468 (2 percent) during full production.

Depending on the route, Hobbs is between 55 and 65 highway miles from the Ochoa mine and processing facility sites. As the largest community in the region, Hobbs has a substantial inventory of motels and RV parks, many new multi-family units added in recent years, and has additional housing in the planning and development stages. It is anticipated that Hobbs would accommodate 30 percent of the incremental Ochoa Project population, which would result in a first quarter population increase of 428 (1 percent of 2010 population) and a 12-month peak increase of 729 (3 percent) during construction, and an increase of 401 (1 percent) during full production.

Other communities near the Ochoa Project site include Lovington in Lea County, approximately 80 miles from the Ochoa Project mine and processing facilities, and Loving and Artesia in Eddy County (approximately 36 and 86 miles from the project site, respectively). In the case of Lovington, and Artesia, the distance of these communities from the Ochoa Project area would be a substantial deterrent for daily commuting. Workers seeking lodging in these communities could have substantial competition from oil and gas workers and workers attempting to find lodging in Artesia also would likely have substantial competition for temporary housing resources from FLETC attendees. While the Village of Loving is relatively close to the Ochoa Project, it currently has no temporary housing resources. For this assessment, it is assumed that a combined total of 5 percent of the incremental population associated with construction and ongoing operations would reside in these communities or elsewhere in the two counties, which would total 71 persons during the first quarter of construction, a peak construction population of 122, and 66 during ongoing operations. The small number and distribution of workers among these other communities would not generate substantial demand for housing or for community infrastructure or services.

In the case of Kermit, Texas, temporary housing is limited and there could be substantial competition for housing from oil and gas workers. In the case of Andrews, it is more distant from the project site (67 miles one way), and has substantial competition for housing from employees of the URENCO NEF, the Waste Control Specialists low-level radioactive waste disposal facility, and oil and gas workers.

A decision to proceed with the offsite power supply option would likely result in slightly lower demand for temporary housing, and elements of that demand would be of shorter duration, than with the onsite power option. Minor differences in the geographic distribution of the demand also might occur. However, the overall differences would not result in substantially different housing or social effects within the study area.

<u>School Age Children</u>

Most construction workers who temporarily relocate to a job site are single, or those who are in a family/household relationship are not accompanied by other household members, particularly children.

As a result, the number of school-age children entering local schools under the Proposed Action would be minimal during the first quarter of construction and estimated at 74 and 119 students during the 12-month construction peak. Based on the proposed development schedule, some of those students could be mid-year transfers who then remain for a short period (i.e., through the end of the school year). The projected long-term increase in school-age children associated with project operations is estimated at between 207 to 307 students. These students would be distributed among the school districts in communities in which the project workers and their families reside. **Table 4.15-6** below displays estimated project-related school-age children by the primary periods of project activity.

Table 4.15-6 Projected Project-related School-Age Children, Proposed Action

	Initial Construction (Months 1 – 3)	Peak Construction (Months 7 – 18)	Full Production
Total	Minimal	74 to 119	207 to 307

The estimated incremental increase in project-related school enrollment would be about 1 percent of 2012 enrollment in Hobbs during full production, when the highest level of school age children is anticipated. Estimated incremental project-related enrollment would be about 1 to 2 percent of 2012 enrollment in Carlsbad during that period. Estimated incremental project-related enrollment would be higher in the smaller communities of Jal (5 to 8 percent of 2012 enrollment) and Eunice (6 to 10 percent of 2012 enrollment). However, both schools have adequate physical capacity and classroom space to accommodate this level of increase (Carrera 2012; Haynes 2012). The actual effects on all school districts would depend on the level of enrollment growth from other sources such as oil and gas development and other energy and industrial projects. If housing shortages continue through the time that the Ochoa Project reaches full production, teacher recruitment could be a concern as teachers could have difficulty acquiring affordable housing.

The following sections, which assess potential housing, infrastructure and services, and fiscal effects, assume the distribution of project-related population described above. These sections also describe potential effects on these resources if higher or lower project-related populations were to relocate to these communities.

4.15.5.3 Housing

Based on the employment and population estimates described above, and anticipated occupancy patterns for construction workers, the Proposed Action would create demand for an estimated 657 housing units during the first quarter of construction, increasing to a peak of 1,179 housing units during months 7 through 18 of construction, and then decreasing to 495 units during ongoing operations. The breakdown of temporary and conventional units is shown in **Table 4.15-7**. Housing units include single and multifamily rentals, mobile home rentals, hotel and motel rooms, and RV rental spaces. These estimates include demand associated with the direct, indirect and induced employment supported by the Ochoa Project.

Table 4.15-7 Projected Project-related Housing Requirements, Proposed Action

	Initial Construction (Months 1 – 3)	Peak Construction (Months 7 – 18)	Full Production
Temporary Units (Motels/RV)	362	632	--
Conventional Units (SF/MF/MH)	295	547	495
Total	657	1,179	495

RV = recreational vehicle, SF = single family, MF = multi-family, MH = mobile home.

An estimated 54 percent of the 12-month peak construction demand (632 units) would be associated with non-local single-status construction workers who temporarily migrate to the area. This demand is likely to be accommodated primarily in hotels, motels and RV parks in Jal, Eunice, Hobbs, and Carlsbad. Single status workers are assumed to share temporary accommodations at the rate of 1.5 workers per hotel/motel or RV unit. The remaining incremental demand (547 units during the 12-month peak construction period) is more likely to be accommodated in conventional housing (single and multifamily units and mobile homes, if available), occupied by construction workers who would expect to be on site throughout much of the overall construction period, by project operations workers who are hired during the construction phase, and by workers relocating to the area to accept indirect or induced jobs supported by the project. If conventional housing accommodations are not available at the time workers in these latter three categories relocate to the project area, they would be required to use temporary accommodations until conventional accommodations become available.

As shown in **Table 3.15-11**, there are 44 hotels and motels located in or near Jal, Eunice, Hobbs, and Carlsbad, offering a total of 2,567 rooms. In addition, 19 RV parks provide a total of 1,382 RV spaces, resulting in a combined total of 3,949 temporary housing units. If all Ochoa Project-related single status workers were able to find hotel/motel and RV spaces in these communities they would absorb 17 percent of these resources. If all project workers (single status workers and workers with households; direct, indirect and induced) were required to use temporary housing resources in these communities during the 12-month construction peak, they would absorb 30 percent of all temporary housing resources, assuming availability. These incremental needs are substantial considering existing demand from other activity in the region, including seasonal tourism in the Carlsbad area.

Other temporary housing resources may be available to accommodate Ochoa Project construction workers. Some communities in the study area have temporarily allowed RV's in areas other than mobile home parks, and recreation-related campgrounds may be made available to construction workers on a temporary basis, if sufficient demand materializes (Moore 2012b).

As noted in Section 4.1.5.2, some non-local workers also may seek housing in other communities such as Lovington, Artesia, Loving, Kermit, and Andrews but the number of such workers is anticipated to be relatively small based on the distance of these communities from the Ochoa Project site, and in the case of Lovington and Artesia, competition for housing from other sources. Loving has no temporary housing and therefore is unlikely to attract many Ochoa Project construction workers.

Motel and RV park proprietors and other landlords would benefit from the Proposed Action-related demand during construction, especially during seasonal periods of low tourism demand. Conversely, construction workers who relocate to Carlsbad may compete with tourism and recreation visitors for temporary accommodations during peak tourism visitation months. Prices for lodging and RV park spaces could increase in response to the project-related demand, particularly in Carlsbad during peak tourism months.

Beginning in the final quarter of construction, total project-related housing demand would decline, and demand would transition from mostly temporary units to conventional housing. At the time of this assessment (third quarter 2012), moderately priced conventional housing was in limited supply in all communities in the study area. However all communities had additional single and multi-family units under construction. Moreover, the projected 50-year duration of the operations phase of the Ochoa Project would likely serve as an incentive to housing developers to respond to unmet project-related housing demand. Consequently, most operations workers should be able to secure housing over time, given the relatively high wages associated with potash industry employment. However, during the initial years of project operations, some workers might not be able to immediately secure their desired type of housing in all communities.

Construction workers are likely to locate in communities nearest the project site, assuming the availability of housing resources. It is possible that larger numbers of construction workers than anticipated for this assessment would locate in the nearby smaller communities of Jal and Eunice. No additions to the temporary housing resources in those communities are anticipated at present. However, other events such as a sharp decline in oil prices resulting in a dramatic slowdown in oil and gas development activity could free up housing resources, allowing higher than anticipated construction-related population levels in Jal and Eunice.

4.15.5.4 Public Infrastructure and Services

Implementation of the Proposed Action would result in increased demand for local government infrastructure and services in counties and communities that host Ochoa Project construction and operations workers. Some local entities also would be required to provide specific services to project facilities and along the access routes to the mine, processing facilities, and rail loadout.

Lea and Eddy counties and the affected communities would experience increased demand for a range of infrastructure and services during construction. Construction-related local government service demand is typically focused on law enforcement, emergency management and response and emergency medical services, and for the host county, road maintenance. To the extent that construction workers use existing temporary housing resources, they are already served by water and wastewater systems, thereby limiting the need for utility expansion or improvement. Development of additional temporary housing could increase overall demand for water and wastewater treatment. Hobbs, Eunice, and Jal all have available capacity to expand to meet the demands, in part due to past efforts to prepare and respond to the demands associated with the construction of the URENCO NEF and oil and gas development. As Ochoa Project operations employment increases and the project transitions from construction to full production, and as indirect and induced workers relocate to the area to work on Ochoa Project-supported jobs, the project-related population would require a broader range of local government facilities and services.

For Lea and Eddy counties and the cities of Hobbs and Carlsbad, the incremental project-related population would range from 1 to 3 percent of 2010 population during construction and 1 to 2 percent during full production. These local governments should be able to respond to these relatively small incremental population-related service demands fairly readily, in most cases. However, the ability to readily respond to demand could be affected by recent, current, and anticipated levels of demand from other sources such as oil and gas development and construction and operations of other energy and industrial projects.

The water and wastewater treatment and storage systems in Hobbs and Carlsbad have adequate capacity to accommodate the relatively small Ochoa Project population increment, but Carlsbad's recent summertime water consumption has exceeded the systems' allocated water rights, consequently even a relatively small population increase could exacerbate a shortage during drought years. The city is currently addressing this issue and could reduce demand by reducing commercial water sales.

In addition to the increased population demand, Lea County provides law enforcement and emergency management coverage, and road maintenance services to the area where the project facilities and access routes would be located. These services would experience increased demand resulting from the project and may require additional staff and equipment. Lea County would receive substantial revenues from the project, described in the following section, but the receipt of such revenues may lag behind the county's need to fund increases in staff and equipment to serve the increased demand. The Lea County Solid Waste Authority would experience increased landfill use from the incremental project-related population and possibly from disposal of construction waste and other approved types of waste from the mine and processing facilities. The landfill has adequate capacity to accommodate the increased volumes of waste for the foreseeable future. Costs for servicing the increased demand would be offset by additional tipping fee revenues.

The Eddy County Sheriff's Department and New Mexico State Police respond to accidents and law enforcement incidents on the highways along the segment of NM 128 within Eddy County and the segments of U.S. 285 and New Mexico 31 that link to NM 128 providing access to the Ochoa Project area. The La Huerta Volunteer Fire Department and EMTs from the Carlsbad Fire Department respond to accidents and health care emergencies on the above-named project access routes. A modest increase in demand for law enforcement and emergency services could be anticipated along these routes.

The City of Jal would experience infrastructure and service demand associated with the estimated 7 to 12 percent increase over 2010 population during construction. Jal water and wastewater systems are adequate to accommodate this level of growth, but the relatively large increase in population in a relatively short period of time could require increases in municipal staff and equipment. Jal would experience demand for a broader range of municipal services associated with the estimated 6 percent population increase during ongoing operations. Long-term production related residents would be anticipated to access community infrastructure and services at rates similar to current residents, and also would generate tax and fee revenues to the community to help offset the costs of providing these services. It is possible that Jal would be required to fund needed staff and equipment expansions to serve the long-term production-related population in advance of the City's receipt of project related revenues.

The Jal Fire Department would cover the Ochoa Project area with emergency response (fire and ambulance) services. The Ochoa Project area is within the Jal Fire District, consequently the district would receive ad valorem property tax revenues on project facilities and production, which in the long term would help offset the cost of providing the additional services. The Fire Department may be required to provide services to the project prior to the receipt of project-related revenues, however. Given that the fire and ambulance services are operated on a volunteer basis, increasing the number of volunteers would be beneficial to meet the additional demand from the project, project-related traffic and the incremental project-related population. The Fire Department would face challenges recruiting additional volunteers during construction.

The City of Eunice would experience increased infrastructure and service demand associated with the estimated 10 to 17 percent increase over 2010 population during construction and 9 percent increase during ongoing operations. As with Jal, this relatively large increase in population in a relatively short period of time could require increases in municipal staff and equipment to accommodate the population increment and maintain existing service levels. Based on these population levels it is possible that the city would add two law enforcement officers and two EMTs (Moore 2012b). City of Eunice water and wastewater systems would be adequate to accommodate the incremental project-related growth. Also as with Jal, Eunice would likely be required to fund the staff and equipment expansions particularly for the production-related population, in advance of receipt of project or incremental population-related revenues.

If higher than anticipated levels of Ochoa Project-related population were to locate in the smaller communities of Jal and Eunice, the above-described effects on those communities could be exacerbated. Both communities have adequate water and wastewater utility and school facility infrastructure to accommodate a substantially higher population than forecast for those communities in this assessment. However, larger project-related populations would likely require additional staff and equipment and those demands would likely occur before substantial project-related revenues accrued to the municipalities. Substantially larger population increments than those forecast for this assessment are not anticipated for Jal and Eunice however, because of the limits on housing availability to accommodate a larger population.

The Lea Regional Medical Center in Hobbs and the Carlsbad Medical Center would both experience increases in patient-visits associated with Ochoa Project construction, operations and secondary work forces and associated populations. Non-local construction workers would likely use emergency rooms for more routine care, because they typically do not have relationships with health care providers in the area, although urgent care clinics in both Hobbs and Carlsbad also could meet such needs. While some hospitals in other areas experiencing influxes of temporary workers have reported increases in uncollected fees during major construction projects, Ochoa project operations workers and most construction workers would have health insurance, which would cover most of their healthcare costs.

The Jal and Eunice medical clinics would similarly experience increased patient loads from the construction and operations work forces. While these increases might result in the short-term need for additional staffing, in the long-term, the larger patient base could allow the addition of new services at both clinics. In addition to insurance revenues, both clinics are supported by hospital taxing districts that include the Ochoa Project area and would provide additional revenues to support clinic services.

Higher than anticipated project-related population levels in the larger communities of Carlsbad and Hobbs would result in less substantial impacts, because of the much larger size of those communities relative to the project-related population increment. Both Carlsbad and Hobbs also have adequate utility infrastructure to accommodate a substantially larger population increase than forecast for this assessment.

4.15.5.5 Public Sector Revenues

The major revenue sources directly associated with the Proposed Action would include federal mineral royalties on the value of production and local ad valorem (property) taxes on the value of production and mining equipment and facilities. The state will realize an incremental gain in severance taxes, as well as deriving GRTs on the taxable value of goods and service purchases supported by the construction and operations of the Proposed Action. Local government and service districts also would benefit from the increase in GRT.

- *Federal/state mineral royalties:* These royalties are determined by terms of lease agreements covering the mined area, resource grade/quality, and value of production. ICP estimated the applicable average royalty rate for the Proposed Action at 2.25 percent. Taxable values are a function of both production and commodity prices and therefore subject to substantial year-to-year fluctuation, as well as uncertainty. Based on assumed production rates and constant commodity prices, ICP anticipates paying in excess of $690 million in royalties over the life of the project. The federal government would retain just over half (51 percent) of the receipts; the remainder would be disbursed to the state. The funds received by the state accrue primarily to the general fund, with subsequent disbursements to public education and other programs.
- *New Mexico severance tax:* Receipts are based on an initial assessment rate of 33.33 percent, from which state and federal mineral royalties and a 50 percent standard deduction are subtracted, the residual being the taxable value, to which a 2.5 percent tax rate is applied. The incremental receipts of severance taxes, based on assumed production and market values, would total approximately $144 million, over the long-term operational life of the project (Shonnard 2012), with annual tax receipts of $3.3 million at full production. Severance tax receipts are first used for debt service on bonds issued by the state, with any remainder accruing to the severance tax permanent fund.
- *New Mexico resource excise tax:* The resources excise tax (Chapter 7, Article 25) provides revenue for public purposes by levying a tax on the privilege of severing and processing natural resources within New Mexico. The tax rate applied to potash is 0.5 percent of the gross revenue from sales, less royalties paid to the state or federal governments. Over the life of the project, total resource excise taxes of $190 million would be paid by ICP, based on the projected production and assumed market value. Average annual receipts of $3.9 million would accrue at full production.
- *Local ad valorem/property taxes:* Assuming a taxable value of 50 percent of gross revenues from previous year's sales and a tax rate of 0.011, implementation of the Proposed Action is projected to yield an average of approximately $5.0 million per year during the first 10 years of operations, climbing to $8.8 million annually at full production. Over the 50-year life of the project, total property taxes based on current tax rates would exceed $300 million. Approximately one-half of that revenue would accrue to Lea County. The remaining revenues

would accrue to the Jal and Eunice school districts, Jal and Eunice Hospital Districts, and to the New Mexico Junior College based in Hobbs. The property tax revenues levied by the school and hospital district distributions would initially accrue to those two districts based in Jal based on the location of the plant and underground resources and tax rates, but over time those based in Eunice would receive revenues as the subsurface production moves northward. **Figure 4.15-3** below depicts the geographic orientation of the project facilities and land area to the two school districts.

Additional revenues would be derived from assessments on mining equipment and facilities, as well as offsite real estate improvements elsewhere in the community, including housing, commercial property, and the rail loadout, that are indirectly supported by the project.

Minor differences in ad valorem tax revenues could be associated with the two power supply options due to differences in taxation policies for improvements associated with public utilities and that associated with mining projects; with revenues from the offsite option likely to be lower. The potential magnitude of these differences is unknown.

- *Gross receipts taxes:* The GRT is levied on business receipts from sales and leases of most goods, property and services. The combined tax rate in Lea and Eddy counties, including the state tax rate of 5.125 percent and local option taxes levied by the counties and municipalities, ranges from 5.5 percent in unincorporated Lea County to 7.4375 percent in Carlsbad (New Mexico Taxation and Revenue Department 2012). GRT would be generated on capital outlays by ICP during project development, as well as ongoing purchases during operations, and purchases made by individuals employed by contractors, ICP and other local businesses and public sector entities in conjunction with the Proposed Action. ICP estimates that it would pay approximately $37 million on capital expenditures associated with initial project development. Additional GRT would be generated during operations, as well as from taxable expenditures by construction and operating workers. Such taxes have not been estimated due to the many factors underlying the local accrual of GRT, such receipts are not estimated as part of this assessment, though they are likely to be substantial.
- *Personal and corporate income taxes:* Construction and operation of the Proposed Action would generate substantial incremental personal and corporate income taxes; however, such taxes have not been estimated.
- *Federal payments in lieu of taxes (PILT):* Implementation of the Proposed Action would not affect the annual federal PILT payments, as it would not affect the acreage of federally managed land in the area; such acreage being a primarily determination of annual PILT.

Local governments and school districts would realize additional GRT on the businesses revenues supported by worker expenditures, and on property taxes on the additional residential and commercial real estate supported by the increase in demand. The accrual of the indirect revenues to municipalities and school districts would be reflective of residency distribution and shopping patterns (i.e., accruing more heavily to Carlsbad and Hobbs). GRT receipts derived from construction worker spending would be lower for the offsite option than for the onsite option, but the differences are unlikely to be substantial.Public service demands associated with the short-term and long-term population growth, jobs, housing, and other factors related to the Proposed Action would result in incremental pressures on public sector expenditures. In the short term, Eunice, Jal, and other local government entities may hire additional law enforcement staff, emergency response staff, and possibly public works/utilities staff to serve the increased demand. However, no major staffing, equipment or facilities and services needs to serve the short-term demands have been identified. Long-term effects on expenditures related to the Proposed Action in all communities would be limited to population-related staff and equipment demand. Consequently, from a fiscal perspective, implementation of the Proposed Action is likely to be somewhat adverse in the short term but beneficial in the long term.

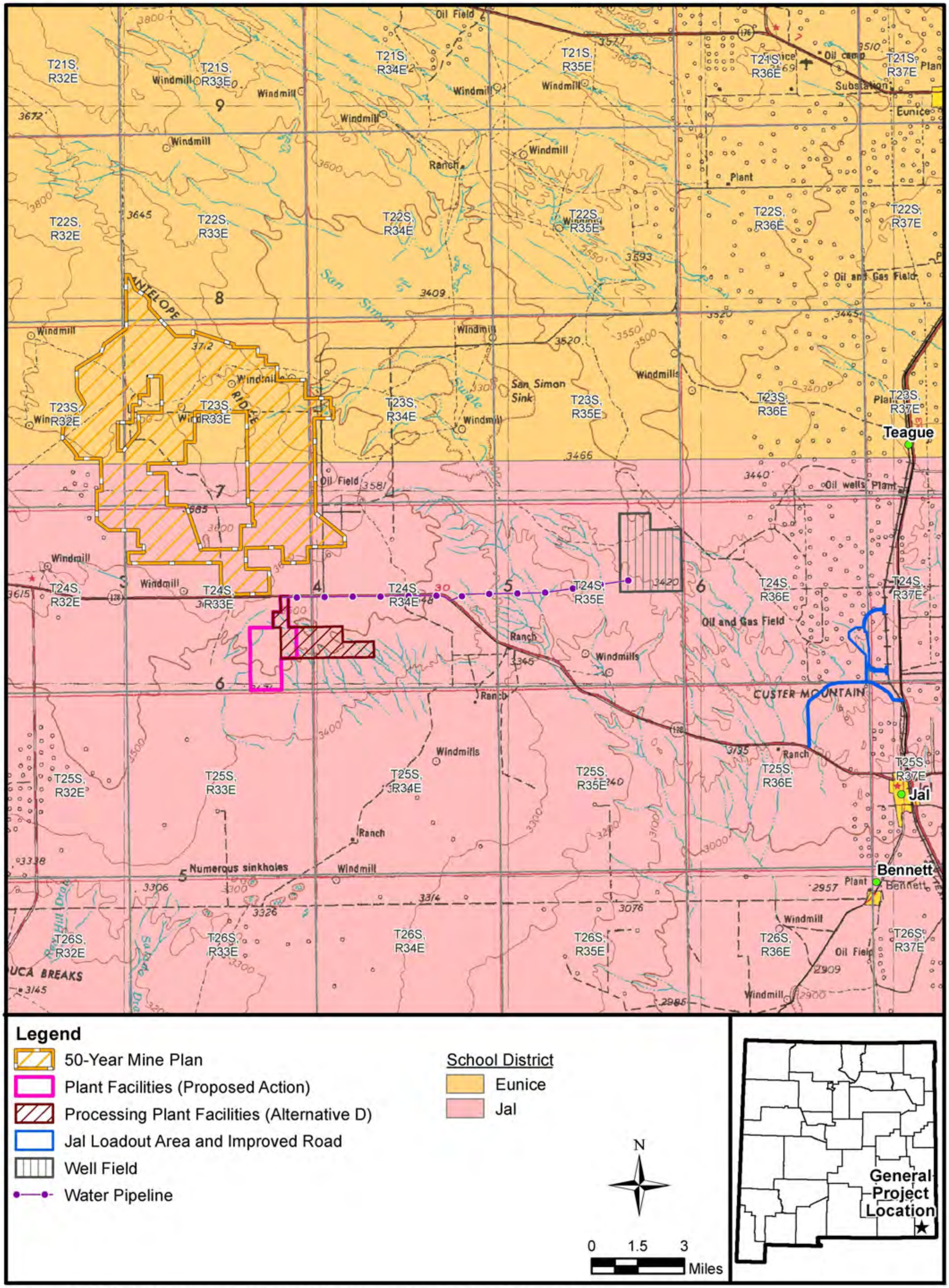


Figure 4.15-3 Ad Valorem Taxing Districts in the Ochoa Project Area

4.15.5.6 Social Organization and Conditions

Lea and Eddy counties and the affected communities are familiar with industrial and natural resource development including potash mining, oil and gas development, and other energy projects, including the temporary work forces associated with such development. Consequently, construction and operations of the Ochoa Project and the presence of the associated work force in the nearby communities would present challenges for the smaller communities in terms of providing certain public services, and may result in crowding in some social settings such as restaurants and recreation establishments in these communities. But these effects are unlikely to result in substantial social disruption. The letters submitted in support of the project by affected municipalities and area economic development organizations during scoping suggest that the project has broad local support. For many residents, the Proposed Action-related economic activity would likely be welcomed.

However, certain individuals, groups and organizations with economic interests in the area who have the potential to be adversely affected by the Proposed Action may be dissatisfied with approval of the project. These may include adjacent landowners, grazing operators who have allotments within the project area, current recreation users of the area, oil and gas operators with existing wells or development interests in and near the project area, and residents of the Jal community. The level of dissatisfaction could be higher among nearby landowners and recreation users of the area given a decision to proceed with the offsite power option, as it would entail another linear ROW across public lands, along with the attendant effects on visual character and current land uses in the affected areas. However, the differences would not be expected to be major given other existing energy related development in the area.

Nearby landowners would experience a change in the rural setting of the area. Although the area around the project site is not pristine—currently there is substantial oil and gas development—the scale and concentration of industrial facilities associated with the mine, processing facilities, and loadout would constitute a change in the character of the landscape near those facilities to a predominately industrialized setting. The change could affect nearby residents and landowners in several ways. Residents and landowners who value the current predominantly rural setting would be dissatisfied with the change to a more industrial setting, as well as project-related increases in the volume and character of vehicular traffic on highways, local roads and streets, and rail traffic on the Texas-New Mexico Railroad through Jal. The change in land use for industrial purposes and the associated activities could alter adjacent landowners' current and planned uses and affect improvements and access roads. Adjacent landowners also have expressed concern about the potential effects on the value of nearby property from the change in the current primarily rural setting with scattered oil and gas features to a more industrialized setting with associated visual impacts from the mine and processing facilities including the large tailings stockpile.

Affected grazing operators could be dissatisfied with the long-term reduction in AUMs related to disturbance, the need for more active livestock management, the potential damage to grazing improvements, the potential increase in noxious and invasive weed species, concern for effects to range health from gypsum eroding off the tailings pile onto nearby rangeland, and additional vehicle/livestock collisions associated with Proposed Action-related traffic (see Section 4.9, Rangelands and Livestock Grazing). The mitigation measure suggested in Section 4.9, coupled with the applicant-committed environmental protection measures described in Section 2.4.7 and the range-related BLM environmental requirements included in **Table 2-4** could help avoid or reduce some grazing operator dissatisfaction.

Outdoor recreation users of lands within and adjacent to the project area and adjacent areas may be dissatisfied with the long-term loss of the use of these lands for recreation purposes, the change in the recreation setting on immediately adjacent lands, and changes in access. However, because there are no designated recreation areas or developed recreation facilities within the project area, the absence of unique recreation resources on these lands, ready availability and access to similar resources in the area, and to date, lack of expressed public concern regarding effects on outdoor recreation, it is anticipated that such dissatisfaction would be minimal.

Oil and gas operators with interests in the project area are concerned about the potential effects of the Proposed Action on existing wells and ancillary facilities such as pipelines and access roads. They also are concerned about potential effects on development of oil and gas leases within and near the project area. The level of acceptance of the Proposed Action by individual oil and gas operators will depend in large part on the development and successful implementation of the framework for managing mineral co-development described in Section 2.4.2.10 of this EIS. The goal of this framework would be to ensure that drilling for oil and gas does not interfere with potash mining, that potash mining proceeds in a way that does not interfere with fluid mineral extraction, and both development activities avoid the creation of safety or environmental hazards. Management of co-development would maximize the recovery of both resources to prevent waste of state and federal minerals and to honor the rights of each lessee.

4.15.6 Alternative B

Under Alternative B, there would be no change to the mining methods or operations, processing methods and buildings, and management of co-development described under the Proposed Action. It is possible that minor changes in work force, equipment, capital investment and annual operating costs would result from changes in the tailings stockpile height, surface, and location. It is likely that the changes in these aspects of the project compared to the Proposed Action would be relatively minor and would not result in substantially different employment, population, housing, public infrastructure and services, or fiscal effects than those identified for the Proposed Action.

Reduction of the height of the tailings pile and the associated reduction in visual impacts could reduce the effects of the project on the rural setting. These reductions could reduce the dissatisfaction that adjacent landowners may feel with this change in setting, but some dissatisfaction would likely still occur.

It is possible that ICP's project revenues would increase if the company were able to secure markets for tailings constituents. Sales of these constituents could result in increased tax revenues for state and local governments. Backfilling of the tailings in the mine would increase the costs of operations.

The differences in social and economic effects associated with the offsite and onsite power supply options for Alternative B would be comparable to those described above for the Proposed Action.

4.15.7 Alternative C

Alternative C would not change the mining methods or operations and processing methods and buildings described under the Proposed Action. The establishment of standards for managing the co-development of minerals could affect the mining plan and schedule, because the BLM would formally coordinate development between ICP and affected oil and gas leaseholders and establish areas of avoidance, drilling islands, or areas for larger mine pillars and could reduce the extraction rate in some areas. The employment and costs of any changes in schedule or mining plans are presently unknown. Changes in the mining plan and schedule would not be anticipated to result in substantially different effects on employment, population, housing, public infrastructure, or services from those identified for the Proposed Action.

Differences in social and economic effects associated with the offsite and onsite power supply options for Alternative C would be comparable to those described above for the Proposed Action.

4.15.8 Alternative D

Under Alternative D, the evaporation ponds and tailings stockpile would be located east of the area identified for those project elements under the Proposed Action. Alternative D also would require relocation of a segment of Vaca Lane through the processing plant site. Because the alternative location for these elements would involve additional private, state, and public lands, additional negotiations for lease or purchase would be required, Alternative D most likely would delay project construction and initial production by two years or longer. The effects of such delays and associated costs on project feasibility or mining plans are unknown. Assuming the project proceeds despite the delays, Alternative D would not be anticipated to result in substantially different effects on employment, population, housing, public infrastructure, services, or fiscal effects compared to those identified for the Proposed Action.

There is a possibility that other changes occurring in baseline conditions during the intervening period could affect the assessment of project-related effects. However, the likelihood, timing, type, and location of such changes are unknown.

Locating the evaporation ponds and tailings stockpile further east could reduce the dissatisfaction that adjacent landowners may feel with this change in setting, but some dissatisfaction may still occur. Some motorists, landowners, and oil and gas operators may be affected by the realignment of Vaca Lane, but most would likely be indifferent assuming the reroute is not appreciably longer or require slower travel.

The differences in social and economic effects associated with the offsite and onsite power supply options for Alternative D would be the same as those described above for the Proposed Action.

4.15.9 Preferred Alternative

Under the Preferred Alternative, there would be no change to the mining methods or operations, processing methods, buildings, and other facilities described under the Proposed Action.

ICP would need to put additional time and effort towards the tasks required for enhanced co-development under the Preferred Alternative. This includes developing more MOUs and coordination with all owners and operators of infrastructure that may be affected by the mine and processing facilities, monitoring and regular reporting required for the surface water, groundwater, and subsidence monitoring plans, participation in stakeholder meetings and ADR as needed, and reporting on co-development activities.

Phased reclamation of the dry stack tailings stockpile would require more time and effort than performing the reclamation only at the end of the project, as described under the Proposed Action.

It is possible that increases in work force, equipment, capital investment, and annual operating costs would result from the additional co-development and reclamation requirements under the Preferred Alternative. However, it is likely that the changes in these aspects of the project compared to the Proposed Action would not result in substantially different employment, population, housing, public infrastructure, services, or fiscal effects than those identified for the Proposed Action. The final determination of the costs to ICP will be evaluated when the BLM completes the evaluation of the valuable deposit described in Section 1.4.2.

4.15.10 Mitigation Measures

No additional mitigation measures are recommended for socioeconomics.

4.15.11 Summary of Impacts

The social and economic effects under all action alternatives comparable to those under the Proposed Action. The costs of operations and possibly revenue generated would be slightly greater under Alternative B. The onset of construction activities, production, and the associated social and economic effects would be delayed under Alternative D, with a risk that the delays and other requirements adversely affect project feasibility.

All action alternatives would result in an increase in employment in the region, with up to 1,440 people employed for construction and up to 502 permanent and contract employees during operations. The increases in regional employment would create more demand for housing and services in the nearby communities and would create an increase in indirect and induced jobs, as well. There would be a substantial increase in public sector revenues that would result from federal and state mineral royalties, state severance taxes and resource excise taxes, local property taxes, state and local gross receipts taxes, personal and corporate income taxes, and federal payment in lieu of taxes. There may be a need for more public service expenditures for utilities, law enforcement staff, teachers, and to serve the other demands for services.

Differences in social and economic effects associated with the two power supply options would be minor. During construction, the offsite option would likely employ less labor, for a shorter period, and involve less capital investment that the onsite co-generation option. As a result, indirect tax revenues would be lower, as would the demand on temporary housing and public facilities and services. Long-term differences, also very minor, would include slightly higher project-related employment, population growth, and related demands on housing and public facilities and services. Slight differences in public sector revenues and effects on recreation and other land use could occur in conjunction with the ROW for the offsite option.

4.15.12 Cumulative Impacts

This section addresses the socioeconomic impact of the project alternatives when added to the past, present, and RFFAs in the study area. Mining, oil and gas, and other energy development (e.g., uranium enrichment and solar energy) are key elements of the existing regional economy and social conditions. Other historically and economically important segments of the region's economic base are agriculture, recreation, tourism, and more recently in the Carlsbad area, retirement migration. The effects of past and current development in the region are evident in the existing settlement patterns, physical development and infrastructure, fiscal structures, and social settings and networks. Such development and the related activities, events, and people associated with it provide the area with its urban development and cultural history.

The collective past development activity has contributed to growth and development and underlies important economic and social conditions and trends in the area. These trends include labor markets characterized by unemployment that is often below statewide levels, higher transient elements of the work force, competition and occasional shortages of qualified labor and cyclical population change. Such growth has provided much of the impetus for new residential and commercial development and expansion of local government infrastructure and services. It also has shaped residential development as in the current focus on construction of multifamily rental units in both Hobbs and Carlsbad.

Social effects of natural resource development also have included some conflict between the mineral and energy resource industries, and between both of those industries and outdoor recreation and grazing interests on public lands. Development-related impacts to recreation arise from fragmentation of contiguous areas available for outdoor recreation, changes in the recreation setting, changes in access, and development related traffic, dust and other factors that affect the quality of recreational experiences.

The Proposed Action and alternatives would occur in the socioeconomic context and setting described above. The past and present development activities helped create a setting based in part on natural resource development, contributing to conditions wherein local labor, housing resources, community infrastructure and local government are capable of and accustomed to accommodating a certain level of energy, mining and other industrial development. However, community housing resources and public services can be strained when high levels of energy development occur simultaneously with other mining and industrial development. Consequently cumulative effects of past and present socioeconomic conditions, when combined with the Proposed Action and alternatives, would depend in large part on the simultaneous level of energy and industrial development in southern Lea and Eddy counties.

Cumulative effects on socioeconomic conditions in the region from the Proposed Action and alternatives, in combination with present and future actions, would arise if the employment, economic activity, population, housing, public service demand, and fiscal aspects of reasonably foreseeable future projects occurred concurrently with those of the Proposed Action and alternatives. Cumulative socioeconomic impacts have the potential to be both beneficial and adverse. Project-related contributions to the cumulative socioeconomic conditions would be comparable with either the offsite or onsite power supply options.

Ongoing oil and gas activity was anticipated as part of the socioeconomic baseline. Future levels of oil and gas activity would be dependent on commodity prices, development plans and strategies of individual oil and gas producers, and in some cases, regulatory approvals. The recent increases in oil and gas activity over current levels are likely to result in higher demands for housing and community infrastructure and services. Most major infrastructure (water and wastewater systems and solid waste landfills) in the affected communities appears to be adequate to accommodate substantial increases in population. Housing resources are currently in short supply and communities would be required to add staff and equipment to accommodate service demands associated with substantial increases in oil and gas development, particularly when combined with demand from the Proposed Action or other action alternatives.

The two counties and some affected communities are currently benefitting from revenues generated by oil and gas development and production and, over time, the local government facility and service improvements that these revenues would afford should allow the counties and communities to accommodate additional growth. Further increases in oil and gas activity would provide additional revenue for local governments, which could be used to sustain facility and service improvements. In some cases, the receipt of additional revenues could lag the need to respond to demand and in some cases the revenues that would accrue to certain entities might not be adequate to fund the needed staff and equipment. Public sector revenues associated with fluid mineral development would still be realized should the Ochoa Mine Project be approved, as a result of the management of co-development. The implementation of modern recovery techniques for fluid minerals, such as horizontal drilling and hydraulic fracturing, would minimize any potential reduction in the overall volume of fluid minerals production in the mine area, thereby avoiding adverse effects on public revenues.

If, on the other hand, oil and gas prices were to fall and development activities were to decrease from current levels, housing resources in affected communities would likely become available and local government services would likely have the capacity to accommodate growth from other sources. Economic activity in Lea and Eddy counties would correspondingly decrease as would oil and gas-related public sector revenues.

Ongoing oil and gas development activity, combined with other industrial, new residential, and commercial construction activity and future product shipping needs of the proposed project would help sustain recent investments and improvements in rail service by the Texas-New Mexico Railroad. These improvements yield economic benefits in the local communities, but may contribute to minor increases in congestion, noise, and other quality-of-life concerns for some residents and landowners.

Ongoing and proposed construction at the URENCO NEF near Eunice also has the potential to create cumulative social and economic effects. Currently, construction at the NEF employs from 750 to 1,000 workers, depending on the particular construction activity that is occurring. Employment levels are anticipated to decrease to 500 to 600 workers during 2013. URENCO is currently completing Phase 2 of construction and also conducting earthwork and concrete construction activities for Phase 3. The URENCO Board of Directors authorized the subsequent Phase 3 construction activities at their December 2012 Board of Directors meeting (URENCO 2012).Phase 3 construction would likely coincide with construction activities associated with the Ochoa Project.

Ongoing construction at the NEF would essentially result in a continuation of current housing and community infrastructure and service conditions in the study area, particularly in Eunice and Hobbs, where a sizeable share of the ICP construction work force would be attracted. Conversely, if Phase 3 construction activities are not approved, temporary housing resources and community infrastructure and service capacities that are now accommodating the Phase 2 construction work force could become available for construction workers associated with the Ochoa Project. Moreover, local businesses that provide goods and services to URENCO construction workers would experience continued economic activity.

4.16 Environmental Justice

4.16.1 Issues

The primary issue associated with environmental justice include the potential for disproportionately high and adverse environmental or human health effects on identified minority or low-income population caused by the proposed project.

4.16.2 Method of Analysis

Information from the U.S. Census and direct observation were used to assess the presence of minority or low-income populations in locations that would be affected by project-related activities or effects. Results of the impact assessment provided the findings related to the potential for high and adverse environmental or human health effects associated with the proposed project.

4.16.3 Assumptions

If disproportionately high and adverse environmental or human health impacts to an identified minority or low-income population that appreciably exceeds impacts to the general population around the project area, those impacts would be considered significant. Because no potentially affected Environmental Justice populations have been identified for this assessment, based on the criteria provided by EO 12898 for NEPA, none of the alternatives would result in Environmental Justice effects.

4.16.4 No Action Alternative

The continuation of current economic activities and social trends under the No Action Alternative would not be anticipated to result in any disproportionately high adverse human health and environmental effects on minority or low-income populations in the region. Consequently, environmental justice concerns would not be expected under the No Action Alternative.

4.16.5 Alternative A—Proposed Action

No potentially affected Environmental Justice populations have been identified for this assessment. Therefore, based on the criteria provided by EO 12898 for NEPA, implementation of the Proposed Action would not be anticipated to result in Environmental Justice effects.

4.16.6 Alternative B

No potentially affected Environmental Justice populations have been identified for this assessment. Therefore, based on the criteria provided by EO 12898 for NEPA, implementation of Alternative B would not be anticipated to result in Environmental Justice effects.

4.16.7 Alternative C

No potentially affected Environmental Justice populations have been identified for this assessment. Therefore, based on the criteria provided by EO 12898 for NEPA, implementation of Alternative C would not be anticipated to result in Environmental Justice effects.

4.16.8 Alternative D

No potentially affected Environmental Justice populations have been identified for this assessment. Therefore, based on the criteria provided by EO 12898 for NEPA, implementation of Alternative D would not be anticipated to result in Environmental Justice effects.

4.16.9 Preferred Alternative

No potentially affected Environmental Justice populations have been identified for this assessment. Therefore, based on the criteria provided by EO 12898 for NEPA, implementation of the Preferred Alternative would not be anticipated to result in Environmental Justice effects.

4.16.10 Mitigation Measures

No mitigation measures are needed or recommended.

4.16.11 Summary of Impacts

No Environmental Justice populations would be affected by the proposed project.

4.16.12 Cumulative Impacts

No potentially affected Environmental Justice populations have been identified for this assessment. Therefore, based on the criteria provided by EO 12898 for NEPA, cumulative impacts to Environmental Justice populations would not be anticipated.

4.17 Summary of Irreversible and Irretrievable Commitments of Resources

Selection and approval of any of the action alternatives could result in the irreversible commitment of specific resources (e.g., the loss of future options for resource development or management), especially for nonrenewable resources such as minerals or cultural resources. It also would result in the irretrievable commitment of resources, defined as the lost production or use of renewable natural resources during the life of the operations. The irreversible commitment of irretrievable resources for this project is anticipated to be minimal. Those resources that would be affected by irreversible or irretrievable commitments are summarized below.

Geology and Minerals. Approximately 5.5 million tpy of polyhalite ore is estimated to be produced for the life of the mine (approximately 50 years). This mining would result in irreversible and irretrievable commitments of polyhalite ore.

Groundwater. Groundwater levels affected by proposed pumping operations are predicted to partially recover in the Capitan Aquifer Formation in the long term. Groundwater recharge would be very slow and unpredictable, but not entirely irreversible once ICP ceases pumping in its proposed water well field. The estimated time to rebound to 90 percent of pre-pumping water levels is 500 years.

Soils. The soils that are excavated to construct project facilities, especially to install the pipeline and construct the new plant facilities and Jal loadout, would be permanently altered because the soil horizons would be mixed. Even after reclamation, soil productivity may return but the excavations would result in irreversible alterations of the natural soils.

Socioeconomics. The economic investment and human effort by employable labor associated with the construction and operation of the proposed project could be considered an irreversible commitment of resources. However, this commitment could be viewed as a positive impact due to the jobs created or maintained in this area that relies on mineral development as a major employer.

Energy. Construction and operation of the proposed project would require the commitment of an irretrievable and irreversible quantity diesel fuel and gasoline, as well as fuel to generate electricity for the processing facilities and other required operations.